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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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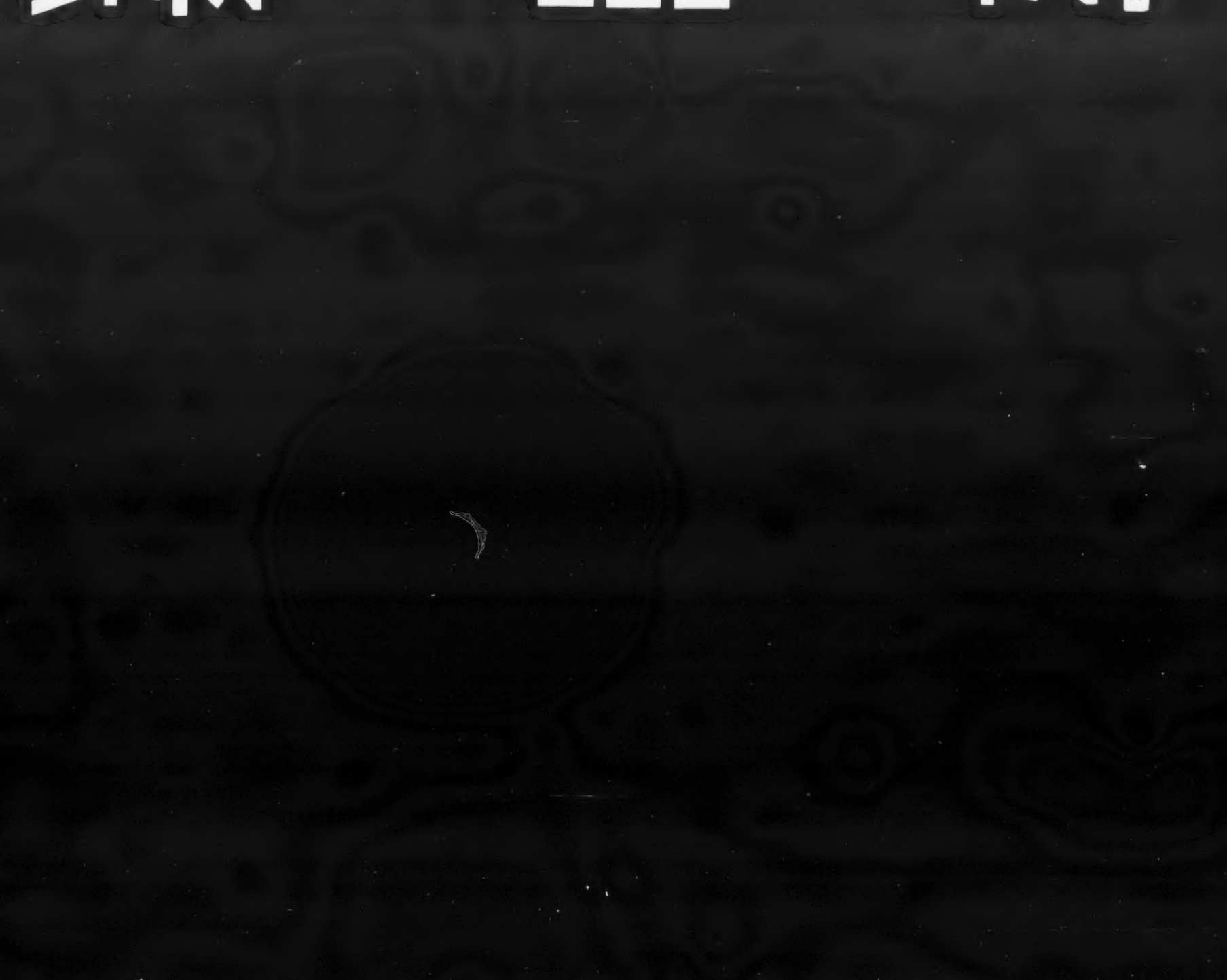

74-0256. Dubos, R. (Author address not given). **James Perkins lecture–health and environment.** *Amer. Rev. Resp. Dis. 108(4): 761-766; 1973.* (2 references)

Chronic respiratory diseases such as emphysema, bronchitis, and lung cancer are increasing. It is expected that environmental management and public health education will be more important in reducing these diseases than drug therapy. Pesticides are one of the many substances contributing to the complex problem of environmental health hazards, and ordinary procedures for purification of air and water do not necessarily remove these poisons. Some substances like DDT and dieldrin cause gross and even fatal pathologies when released from stores in the fat or liver by stress, infection, starvation, pregnancy, lactation, or intoxication. Public pressure will be required to make governments and scientific establishments give priority to the study and control of environmental health hazards.

74-0257. Maier-Bode, H. (Pharmakol. Inst., Rheinische Friedrich-Wilhelms-Univ., Bonn, Germany). **Umwelt- und Rueckstandsfragen bei der Anwendung von Herbiziden im Forst. [Residues and side-effects of herbicides in forest protection.]** *Anz. Schaedlingsk. Pflanzen- Umweltschutz 46(2): 17-24; 1973.* (22 references) (German)

Many of the herbicides currently authorized for use in forestry in West Germany cause problems with residues and possible side-effects. When applied as prescribed, these herbicides which include amitrole, chlorthiamid, dalapon, dichlobenil, paraquat, simazine, and 2,4,5-T are not harmful to terrestrial and aquatic flora and fauna, water quality, and wildlife. Damages to plants, aquatic organisms, and bees can be avoided by observing the directions for application. Dichlobenil, parathion, and sometimes DDT and chlorthiamid are harmful to bees; amitrole, dalapon, paraquat, simazine, and 2,4,5-T are not. Berries and mushrooms in treated forests usually contain residue levels too low to be harmful to humans. Groundwater contamination is negligible due to the low expenditure and the high adsorption ability of forest soils and herbicides should not be applied near surface waters. Zero tolerance for amitrole residues in foods has been established. Very low residues and rapid elimination of chlorthiamid and dichlobenil were determined; and dalapon, 2,4,5-T, and paraquat were rapidly eliminated from humans and animals as well as from fruits.

74-0258. Potash Institute of North America (1649 Tullie Circle, N.E., Atlanta, GA 30329). **Facts about our environment.** *Farm Chem. 136(10): 22-23; 1973.*

Without chemicals and antibiotics the U.S. could not produce enough food to feed the population even at subsistence levels. Use of these chemicals does not result in dangerous residues on fruits and vegetables although very low levels of the chemicals can be detected. The time lapse between application and harvest allows residues to dissipate to the extent that a whole acre of corn, for example, would have to be consumed in one day in order for the pesticide residue to be lethal. Small amounts of some residues are concentrated in the fat, where they are harmless, or are metabolized in the liver and eliminated. Pesticides have improved both the quantity and quality of our food supply and present no risk to man.

74-0259. Tachikawa, R. (Fac. Agr., Ehime Univ., Matsuyama, Japan). **[Organic chlorinated compounds.]** *Farumashia 7(10): 710-711; 1971.* (Japanese)

Analyses of organochlorine residues are conducted by gas chromatography with an electron capture detector attachment. This extremely sensitive equipment requires much training and skill in handling and good maintenance. The apparatus is also incapable of separating complex chemical compounds and almost requires preliminary "cleanup" before gas chromatography can be used. An accurate measurement of residue often depends on the cleanup technique. Of the three million ton a year production of chlorine in Japan, 68% is used for the production of solvents, pesticides, plastics, dyestuffs, and detergents. The yearly production of BHC is 45,000 tons, DDT 5000 tons, PCP 15,000 tons, and PCB 10,000-15,000 tons. It is not accurate to assume that 45,000 tons of BHC will be totally discharged into the environment, but how this will affect the environment and methods of research and investigation are discussed. Based on the results of statistical data and analysis of factors which control pesticide residues, a model to follow degradation routes of pesticides in soil, water, and air will be constructed. The model will be refined by repeated lab experiments and actual measurements in the environment. By this environmental model, the residue levels in various phases of environment will be predicted.

74-0260. Franck, R. (Max von Pettenkofer-Institut, Bundesgesundheitsamt Berlin, Berlin, Germany). **Lebensmittelhygienische Beurteilung von Pestiziden heute. [Evaluation of pesticides with reference to food hygiene.]** *Fette Seifen Anstrichm. 75(4): 217-223; 1973.* (German)

A comparative characterization of the toxic properties of pesticides is essential from the viewpoint of public health. In West Germany, materials are classified into three categories of poisons according to the LD50. Acute toxicity of most pesticides is usually only a minor hazard as compared to the chronic toxicity. Toxicological tests are usually performed on rats and dogs in 90-day acute and 2-year chronic feeding studies. To assess toxicity of pesticide residues which are ingested with food, extensive biochemical and biological tests are required. For comparison of toxic properties of pesticides, no-effect doses are established. Consideration is also given to metabolism of the pesticides in animals and chemical analyses searching for the presence of highly toxic contaminants (such as dioxin in 2,4,5-T) to deter-

mine safety. The principal biocides currently in use include aldrin, DDT, dieldrin, toxaphene, lindane, heptachlor, parathion, fenthion, diazinon, demeton, endothion, malathion, dimethoate, ethion, azinphos, mevinphos, phosphamidon, dithiocarbamates, thiuram disulfides, zineb, maneb, thiram, benomyl, captan, quintozen, trichloroacetic acid, phenoxyacetic acids, urea derivatives, and heterocyclic compounds.

74-0261. Kazantzis, G. (Dept. Med., Middlesex Hosp. Med. School, London, W.1., England). **The poison chain for mercury in the environment.** *Int. J. Environ. Stud. 1: 301-306; 1971.* (18 references)

Organic mercurials, which are more toxic than inorganic salts of mercury, enter the environment as fungicides and are converted to inorganic mercury by living systems. When used as fungicides, these compounds can be leached out of soil, eventually reaching waterways, or escape from wood pulp processing plants. In Japan, agricultural uses have been limited since an average concentration of 0.1 ppm mercury was found in rice. In 1966, Sweden banned the use of mercury seed dressings because of the large numbers of birds dying of mercury poisoning. Since that time mercury levels have decreased in birds at the end of the terrestrial food chain and increased in birds at the end of the aquatic food chain. Mercury concentration in some Swedish waters may prohibit production of edible fish for 50 or 60 years. Mutagenic and teratogenic effects of mercury have been observed at concentrations below those causing intoxication.

74-0262. Fukami, T. (Nat. Inst. Agr. Sci., Tokyo, Japan). **[Recent trends in agricultural chemicals].** *Kagaku Kogyo (Chem. Ind.) 24(3): 340-346; 1973.* (Japanese)

Newer pesticides replacing DDT, BHC, endrin, dieldrin, parathion, methylparathion, and EPN include organophosphates with low toxicity such as MEP (fenitrothion), MPP (fenthion), malathion, DEP (trichlorfon), DDVP (dichlorvos), diazinon, ethylthiometon, and PAP (phenthoate). Other new pesticides are cartap, chlordimeform, and methomyl. The chemical compositions and effects of these chemicals are discussed. New types of fungicides are PCBA, kasugamycin, blastocidin S, IBP (Kitazin P), and EDDP (Hinosan). A new fungicide for rice plants, Rabcide, is often used. For vegetables and fruits, dithianon, TPN, thiophanate, oxyisoxazole, and benomyl are popular. Herbicides more frequently used these days are benthiocarb, CNP, paraquat, MCC (swep); the use of PCP decreased drastically. Antibiotics and aminoacid pesticides are briefly mentioned. The use of minimal amounts of low toxicity chemicals is advocated as a control measure for residue hazards. The more recently advocated integrated control means effective combinations of biological, chemical, and physical methods of controls or combinations of species and cultivation methods in order to obtain multiplied effects in controlling agricultural hazards. In addition to presently used pesticides, natural enemies of insects, such as pheromones, insect hormones, and plant growth regulators may be used.

74-0263. Tribe, D. E. (Fac. Agr., Univ. Melbourne, Parkville, Vic. 3052, Australia). **A pestilence of people.** *Med. J. Aust. 2: 803-810; 1972.* (23 references)

Present uncontrolled world population growth threatens man's existence through famine, pollution of the ecosystem, depletion of resources, and fatal social and economic changes. Food production cannot increase at a rate sufficient to keep pace with the population increase unless chemicals are used. It is expected that pesticides will be required in much greater amounts to maintain just a small increase in food production. Since agricultural practices of even the most well informed countries have resulted in unwanted damage to the environment, it is expected that in developing nations, where misuse of pesticides and other chemicals will be probable, ecological problems will be multiplied. The use of newer, more selective chemicals, which are being produced at a rate of about 30 per year, in combination with biological controls and proper management is the key to future success in producing the food necessary to sustain man.

74-0264. Lofgren, J. A.; Noetzel, D. M.; Harein, Pl. K.; Cutkomp, L. K. (Author address not given). **Insecticides and their uses in Minnesota—1973.** *Minn. Univ., Agr. Ext. Serv., Ext. Bull. 263: 1-47; 1973.*

Aspects relating to safe, legal use of pesticides in Minnesota are discussed in this review. In addition to Federal regulations, Minnesota has requirements for registration of pesticides, licensing of custom applicators, and restriction of use of these chemicals. Aldrin, dieldrin, endrin, heptachlor, lindane, DDT and TDE, inorganic arsenicals, and mercury may not be used within the state except for certain designated purposes, and products containing these chemicals may not be displayed in retail establishments. Disposal of excess pesticides and containers is regulated by the Minnesota Pollution Control Agency. Choice of pesticide should also depend on effectiveness and toxicity to mammals and honeybees. The relative toxicities of organochlorine and organophosphate pesticides are included, along with appropriate antidotes.

74-0265. Heidler, G. (Lab. fuer botanische Mittelpruefung, Biol. Bundesanstalt, Braunschweig, Germany). **Der Einsatz von Herbiziden an und in Gewaessern. [The use of herbicides on and in surface waters.]** *Nachrichtenbl. Deut. Pflanzenschutzdienstes. 25(6): 91-93; 1973.* (6 references) (German)

Environmental hazards are involved in the use of herbicides on and in surface waters; measures to be

taken to lessen these hazards are discussed. To prevent or alleviate environmental and health hazards, only specific pesticides may be used in and around waters, also depending on preliminary authorization. Herbicides must not be used in drinking water catchment areas, including catchment areas of groundwater supplementation facilities, in mineral springs, and in spawning grounds. The use of herbicides is permitted in waters with flow rates exceeding 1 cm/sec, in waters in recreational areas with and without aquatic sports, in fishing waters, dams and dikes, and in national parks. Water from herbicide-treated water bodies may be used for irrigation and watering only after expiration of a prescribed waiting time. The same applies to the use of grass from herbicide-treated areas.

74-0266. Parrish, P. R. (Environ. Protect. Agency, Gulf Breeze Lab., Sabine Island, Gulf Breeze, FL). **A respirometer for determining the effect of pesticides and related pollutants on oxygen consumption of estuarine fishes.** *IN: Proceedings of the Twenty-Fifth Annual Conference, Southeastern Association of Game and Fish Commissioners. J. W. Webb, ed., Charleston, SC 1971, pp. 602-606.* (12 references)

A continuous-flow respirometer was constructed to follow changes in oxygen consumption of estuarine fishes in response to various pesticides. Glass or teflon was used for any parts coming in contact with pesticides so that they could be cleaned efficiently. Filtered sea water which was irradiated and passed over heating or cooling coils for temperature control was fed into 10 experimental and 10 control chambers capable of holding fish of different sizes. Stopcocks and flow meters were installed in each chamber to control and monitor the flow. Water, collected in BOD bottles, was analyzed for dissolved oxygen by the Winkler method. A syringe pump was used to distribute pesticides into experimental chambers. Water samples collected simultaneously from chambers to which DDT had been added at a concentration of 100 ppb contained from 50 to 64 ppb uncorrected for recovery.

74-0267. Mel'nikov, N. N. (Author address not given). **Khimicheskiye sredstva zashchity sel'skokhozyaystvennykh rasteniy i zhivotnykh. [Chemical means of agricultural plant and animal protection.]** *Vestn. Akad. Nauk SSSR 3: 18-24; 1973.* (Russian)

When a new pesticide product is introduced, preliminary data from chemical, biochemical, physiological, toxicological, entomological, and phytopathological tests is considered; today, the rate of degradation is examined and a high rate is required. Complete degradation of pesticides such as DDT, BHC, and arsenic compounds in the soil takes over 18 months; that of chloroaminotriazines, picloram, and diuron type urea derivatives takes less than 18 months; that of benzoic acid derivatives and carbonic acid amides takes about 12 months. However, metabolism of some pesticides in soil is completed within 3-6 months if doses prescribed for application were followed. With the development of adequate therapeutic measures for pesticide poisoning, the rate of metabolism in humans or animals is more important than acute toxicity during treatment. DDT and other organochlorine pesticides metabolize rather slowly; the rate of elimination of most of the organophosphorus pesticides is fairly high. Most carbamates are metabolized rapidly in warm-blooded animals due to oxidative-hydrolytic processes associated with the destruction of the aliphatic part of the molecule. The mechanism of action, toxicity, and metabolism of different groups of pesticides are discussed.

74-0268. Anonymous. **Current problems of the human environment.** *WHO Chronicle 27(7-8): 325-328; 1973.*

Attaining the WHO goal of universal good health involves the promotion of a healthy environment and limiting levels of pesticides in food, water, and air. The Stockholm Conference of 1972 proposed the organization of an internationally coordinated research program in the area of food contamination and recommended that support be increased for the Codex Alimentarius Commission's efforts to establish international food standards. WHO has already estimated the potential intakes of a number of pesticides in food, but, in some cases, methods of assessment need to be reviewed. Planning and implementation of programs to assess environmental health conditions by member states will be supported and assisted by WHO.

74-0269. FAO/WHO (1211 Geneva, 27 Switzerland). **Pesticide residues in food.** *WHO Tech. Rep. Ser. 525: 1-50; 1973.*

The report of the 1972 Joint FAO/WHO meeting on pesticide residues reviewed pesticide problems and called for additional information for future annual meetings. Support for research will be solicited from international organizations, governments, and manufacturers' associations; insufficient information was available at the 1972 meeting to determine acceptable daily intakes (ADI). A decision was made to lower the ADI of DDT to a conditional 0.005 mg/kg and to review data in the future. Although agricultural uses of mercurials contribute very little mercury to the environment, human poisonings have resulted from consumption of seed meant for sowing. A recommendation was made that the possibility of replacing mercurials with less poisonous compounds be studied.

74-0270. Archer, T. E. (Dept. Environ. Toxicol., Univ. Calif., Davis, CA 95616). **Removal of dicofol (Kelthane) residues from apple pomace.** *Arch. Environ. Contam. Toxicol. 1(3): 281-287; 1973.* (6 references)

Results of an investigation of chemical and physical decontamination procedures for dicofol indicated that residues in apple pomace (seeds, peel, stems, cores) could be reduced sufficiently to use pomace as a feed by-product. Apples were sprayed in the laboratory, processed in a pulper-finisher, and the pomace subjected to various treatments. Heating the pomace at 100° for 24 hr with and without excess moisture removed 59.0 and 81.7% of the total dicofol residues, respectively, and addition of dry powdered alkali increased these values to about 90.0 and 99.1%. Vapor washing with water removed up to 51.6% and vapor washing with isopropanol reduced the dicofol by 65.6%. Cool-air drying, sunlight drying, UV drying, and hot-air drying further reduced the residues from water-vapor-washed samples 24.2 to 43.3% and from isopropanol-vapor-washed samples from 68.0 to 94.0%.

74-0271. Mughal, H. A.; Rahman, M. A.* (Dept. Biochem., Jinnah Postgrad. Med. Cent., Karachi, Pakistan). **Organochlorine pesticide content of human adipose tissue in Karachi.** *Arch. Environ. Health 27(6): 396-398; 1973.* (20 references)

The organochlorine group of pesticides, because of their persistence in tissue, are suspected of having adverse effects on human health. The present article is a report on the concentration of seven organochlorine compounds in the stored fat of 60 subjects from the Karachi, Pakistan, area who gave no history of occupational exposure to pesticides. The results indicate that people living in this city are heavily exposed to DDT, moderately exposed to benzene hexachloride (BHC), and only lightly exposed to aldrin/dieldrin. The extent of the exposure to pesticides was not related to the age, sex, type of material, residential location of subjects, or period during which samples were collected. The higher mean concentration of dichlorodiphenyl dichloroethane (DDD, TDE) in the postmortem specimens is probably due to microbial metabolism of DDT under anaerobic conditions after death. (Author abstract by permission)

74-0272. Hylin, J. W. (Dept. Agr. Biochem., Univ. Hawaii, Honolulu, HI 96822). **Oxidative decomposition of ethylene-bis-dithiocarbamates.** *Bull. Environ. Contam. Toxicol. 10(4): 227-233; 1973.* (18 references)

Maneb, suspended or dissolved in buffer or exposed to moist soil, decomposed at an increasing rate with the evolution of CS_2 until approximately 20% of the CS_2 had been released. The decomposition was slower at alkaline pH, and in soil, rather than aqueous suspensions or solutions, and no decomposition took place under nitrogen. Ethylene thiourea (ETU), ethylene thiuram monosulfide (ETM), sulfur, and a trace of either ethylene diamine or unreacted maneb were recovered from the reaction flask. From the results obtained in the study it appears that ETU is formed as a direct result of a more or less spontaneous degradation of ethylene thiuram disulfide (ETD), formed by the oxidation of maneb. If oxygen could be excluded during the storage and use of ethylene-bis-dithiocarbamates, ETD formation might be minimized.

74-0273. Crosby, D. G.; Leitis, E. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **The photodecomposition of trifluralin in water.** *Bull. Environ. Contam. Toxicol. 10(4): 237-241; 1973.* (12 references)

Photodecomposition of trifluralin in aqueous methanol was very rapid, yielding 6 products in less than 2 min and about 25 products in 3 hr. Products obtained after irradiation of aqueous suspensions of trifluralin with or without soil were similar to those obtained in aqueous methanol, but photodecomposition was about 1/10 as rapid. 2-Amino-6-nitro-*α,α,α*-trifluoro-*p*-toluidine was the primary product under acidic conditions, while 2-ethyl-5-nitro-7-trifluoromethylbenzimidazole was the major product at alkaline pH. Two previously undetected, highly polar compounds were identified as the corresponding benzimidazole-3-oxide and 2,3-dihydroxy-2-ethyl-7-nitro-1-propyl-5-trifluoromethyl benzimidazoline. Polar photolysis products would be expected to predominate in natural soils and waters in which the pH range was 6 to 8.

74-0274. Pierce, R. H., Jr. (Univ. of Rhode Island, Kingston, RI). **A study of the mechanism of the adsorption of chlorinated hydrocarbons in marine sediments.** *Diss. Abstr. Int. 34(5): 2196B; 1973.*

Adsorption of DDT by marine sediments was investigated using model systems and natural systems. In the model studies, humic acid adsorbed 96%, montmorillonite adsorbed 70%, kaolinite adsorbed 40%, and the marine sediment adsorbed 82% of the DDT in distilled water solution. The adsorbing capacity of humic acid was reduced after extraction with benzene/methanol solution, indicating that lipoidal materials are involved in DDT adsorption here. Removal of the benzene/methanol-soluble lipoidal fraction (0.4% by weight) from the sediment produced no significant reduction in the adsorption capacity. Removal of the humic fraction (2.8% by weight) reduced the adsorption capacity to less than 50% of that in the original sample. For montmorillonite clay and the marine sediment, adsorption and desorption followed essentially the same isotherm, whereas isotherms for humic acid exhibited a hysteresis effect. Equilibrium was attained in 24 hours for montmorillonite clay and marine sediment; lowering the temperature from 25°C to 5°C increased adsorption. A longer time was required for equilibrium with humic acid, and adsorption was slightly reduced at the lower temperature. The isosteric heat of adsorption was in the

range of physical adsorption for all adsorbents. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-27,023.)

74-0275. Malkomes, H. P.; Foelster, E.; Hoffmann, G. M. (Inst. f. Pflanzenkrankheiten und Pflanzenschutz, Tech. Univ. Hannover, Hanover, Germany). **Bromidrueckstaende und Ertragsbeeinflussung bei Gemuesekulturen nach Bodenbehandlung mit Methylbromid. [Bromide residues and yield of vegetables after soil fumigation with methyl bromide.]** *Gartenbauwissenschaft 37(6): 471-493; 1972.* (37 references) (German)

Bromine contents in cucumber, tomato, lettuce, cabbage, beets, carrot, kohlrabi, and radish samples collected from markets in Germany were 0-19, 0-50, 0-50, up to 2.4, < 8, < 2, < 1, and < 5 ppm. Analyses of vegetables taken from farms where the soil was fumigated with methyl bromide (Terabol) showed an accumulation of bromine up to 50 ppm in cucumbers and tomatoes. The bromine content reached up to 100 ppm in lettuce, kohlrabi, radish, spinach, and different cabbage cultivars. Methyl bromide expenditure (50 or 75 g of methyl bromide per m^2) and bromine residue levels in vegetables were related. The nitrogen supply in the soil did not affect the bromine residues, and the latter did not noticeably influence the crops. Soil leaching after fumigation but before cultivation reduced the bromine content in the vegetables by 30 to 50%. By the end of harvesting, the bromine residue level decreased to or below 50 ppm.

74-0276. Herzel, F. (Inst. f. Wasser-, Boden- u. Lufthyg., Berlin, Germany). **Gefaehrdung von Grund- und Oberflaechenwaessern durch Gifte und Reststoffe aus Abwasser und Ablagerungen. [Groundwater and surface water contamination with toxic substances and residues from waste waters and deposits.]** *Gewaessersch.-Wasser-Abwasser 10: 367-376; 1973.* (German)

Contamination of groundwater and surface waters by organochlorine pesticide residues is indicated by the presence of pesticides in water, suspended matter, and sediment samples. In these samples taken from the Rhine and its tributaries γ-BHC, lindane, heptachlor, heptachlor epoxide, aldrin, endosulfan, dieldrin, DDE, TDE, DDT, and parathion were present. Water samples did not contain dieldrin; sediment samples were free of γ-BHC, heptachlor, heptachlor epoxide, DDT, and parathion; suspended matter samples did not contain aldrin. The contamination is most probably due to the intense use of the pesticides investigated in wine, fruit, and hop growing, as well as to direct discharges from pesticide manufacturing plants in the water catchment area of the Rhine and its tributaries.

74-0277. Randers, J. (Systems Dynamics Group, A. P. Sloan School of Management, M.I.T., Cambridge, MA 02139). **System simulation to test environmental policy: DDT.** *Int. J. Environ. Stud. 4(1): 51-61; 1972.* (30 references)

The movement of DDT in the environment has been simulated using Systems Dynamics to illustrate the application of such a system in estimating future impact of a given policy and determining in which areas to concentrate research. Only a part of the DDT applied reaches or remains on the soil, and there is considerable movement in the atmosphere before it finally settles in soil or in the ocean and concentrates in the food chain. Higher animals in the food chain have been left out of the model, but they have only a small portion of the total global DDT. Tests of the system indicate that errors in each individual study used as input have little significance in relation to the whole. The results of the study suggest that DDT levels in fish would continue to rise for another 2-50 yr, depending on the policy adopted, even if use were stabilized or decreased in 1972.

74-0278. Pennington, J. T.; Calloway, D. H. (Dept. Nutr. Sci., Univ. California, Berkeley, CA). **Copper content of foods.** *J. Amer. Diet. Ass. 63: 143-153; 1973.* (67 references)

Fungicides and fertilizers are factors influencing the copper content of foods. Spraying or dusting with copper fungicides can increase the content above the normal range because of surface contamination although there is still disagreement concerning the increase in actual copper content in relation to such applications. A 40% increase in copper was found at harvest in potatoes treated with a copper spray when compared to controls. Tomatoes and wheat have accumulated the metal in some cases and not in others. A table containing foods consumed in N. America and Britain gives mean copper content and ranges.

74-0279. Davidson, J. M.; McDougal, J. R. (Dept. Agron., Oklahoma State Univ., Stillwater, OK). **Experimental and predicted movement of three herbicides in a water-saturated soil.** *J. Environ. Qual. 2(4): 428-433; 1973.* (19 references)

The equilibrium adsorption characteristics of 1,1-dimethyl-3-(α,α,α-trifluoro-*m*-tolyl) urea (fluometuron), 4-amino-3,5,6-trichloropicolinic acid (picloram), and 2,4-bis(isopropylamino)-6-(methylthio)s-triazine (prometryne) on Ca-saturated Norge loam soil were measured and were found to fit the Freundlich equation. A solution of each herbicide was displaced through a water-saturated column of Norge loam soil at various average pore-water velocities (5.6 to 0.57 cm/hour) and effluent samples evaluated to determine the importance of adsorption kinetics to the mobility of the herbicide. The displacement of each herbicide through the soil was significantly influenced by the average pore-water velocity. The use of a kinetic

adsorption model in a convective transport equation did not adequately predict the shape of the effluent concentration distribution at the high pore-water velocities, but did give the left-hand shift exhibited by the data. The tailing noted in all the herbicide effluent concentration distributions resulted primarily from the nonsingularity between the adsorption-desorption process. Equilibrium adsorption and desorption isotherms were measured for picloram on Ca-saturated Norge loam soil. (Author abstract by permission)

74-0280. Estes, G. O.; Knoop, W. E.; Houghton, F. D. (Dept. Plant Sci., Univ. New Hampshire, Durham, NH). **Soil-plant response to surface-applied mercury.** *J. Environ. Qual. 2(4): 451-452; 1973.* (18 references)

Mercury from an organomercurial fungicide accumulated in surface soils, with negligible lateral migration, following annual applications of 2.10 kg/ha over a period of 15 years. No toxicity was apparent from relatively high soil levels of Hg (455 ppm) on the growth of velvet bentgrass (*Agrostis canina* L.). Elemental composition of turf plants showed 1.68 ppm Hg with normal levels of other transition elements (Mn, Fe, Cu, Zn). (Author abstract by permission)

74-0281. Willis, G. H.; Hamilton, R. A. (U.S. Dept. Agr., Agr. Res. Sta., Baton Rouge, LA). **Agricultural chemicals in surface runoff, ground water, and soil. I. Endrin.** *J. Environ. Qual. 2(4): 463-466; 1973.* (11 references)

Endrin (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-*endo, endo*-5,8-dimethanonaphthalene) was surface applied at a rate of 0.337 kg/ha to sugarcane (*Saccharum officinarum* L.) plots instrumented to sample surface runoff and ground water. Runoff, ground water, and soil samples were collected over a 2-year period and analyzed for endrin. Only small amounts of endrin were lost annually in runoff (less than 0.2% of that applied), and little endrin accumulated in soil. Trace amounts of endrin appeared to move through soil in the plots but not through soil columns. A delay of 72 hours between application and rainfall decreased the amount of endrin in runoff, ground water, and soil. (Author abstract by permission)

74-0282. Lutz, J. F.; Byers, G. E.; Sheets, T. J. (North Carolina State Univ., Agr. Exp. Sta., Raleigh, NC 27607). **The persistence and movement of picloram and 2,4,5-T in soils.** *J. Environ. Qual. 2(4): 485-488; 1973.* (24 references)

The movement and persistence of picloram (4-amino-3,5,6-trichloropicolinic acid) and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) were studied on a western North Carolina watershed on which extensive agronomic, hydrologic, and climatic data had been accumulated over a period of 18 years. Picloram was more persistent than 2,4,5-T; approximately 60% of the picloram and 90% of the 2,4,5-T disappeared in 15 days. There was some penetration into the soil, but a very high percentage of the total amount present at the different sampling periods was in the 0- to 7.5-cm layer. Doubling the application rate (4.48 vs. 2.24 kg/ha) resulted in a two-fold increase in the amount of herbicide recovered at each sampling period. Very little downslope movement of either herbicide occurred even though the average slope on the plots was approximately 27%. Practically no herbicide was found more than 0.3 m, and none beyond 1.2 m, downslope. More picloram than 2,4,5-T moved. (Author abstract by permission)

74-0283. Wang, C. H.; Broadbent, F. E. (IRI Res. Inst., Inc., Caixa Postal 258, Belem-Para, Brazil). **Effect of soil treatments on losses of two chloronitrobenzene fungicides.** *J. Environ. Qual. 2(4): 511-515; 1973.* (16 references)

PCNB (pentachloronitrobenzene) and DCNA (2,6-dichloro-4-nitroaniline) are widely used as soil fungicides and have been found to be quite persistent in soils at field moisture capacity. Laboratory experiments were conducted to determine the effects of flooding, sterilization, addition of organic matter, atmosphere composition, free or combined oxygen, and soil temperature on pesticide decomposition. Known quantities of fungicides were added to three different California soils and analyzed for residual concentrations after incubation under controlled conditions. Samples were extracted with acetone and analyzed by gas-liquid chromatographic analysis (GLC). Both fungicides were rapidly lost from soils made anaerobic by flooding or exclusion of oxygen. Losses were mainly due to microbial degradation. Loss rates were inversely related to organic matter content. Pentachloroaniline and possibly pentachlorothioanisole were found to be degradation products of PCNB. Organic amendments increased the rate of fungicide loss under flooded conditions, but not at field capacity. Degradation in flooded soils was retarded by free oxygen or combined oxygen in nitrate form. Rates of loss varied directly with temperature from 15 to 35°C. (Author abstract by permission)

74-0284. LaFleur, K. S.; Wojeck, G. A.; McCaskill, W. R. (South Carolina Agr. Exp. Sta., Clemson Univ., Clemson, SC 29631). **Movement of toxaphene and fluometuron through Dunbar soil to underlying ground water.** *J. Environ. Qual. 2(4): 515-518; 1973.* (27 references)

One hundred kilograms per hectare of toxaphene (octachlorocamphene) and 40 kg/ha of fluometuron (3-[*m*-trifluoromethylphenyl]-1,1-dimethylurea) were applied to Dunbar topsoil in a fieldplot in the South Carolina Coastal Plain. Loss of both pesticides from the topsoil and accumulation in underlying ground water were monitored for 1 year. Toxaphene loss from topsoil

seemed to occur in two stages. The second (major) stage was crudely linear on a log residue vs. log time plot. Half-residence time in topsoil was about 100 days. Fluometuron loss from topsoil occurred in one continuous episode that was crudely linear on a log residue vs. linear time plot. Half-residence time in the topsoil was about 120 days. Toxaphene and fluometuron were found in underlying ground water within 2 months after they were applied to the topsoil. Both pesticides persisted in ground water during the entire year. Overall, concentrations gradually decreased with time. (Author abstract by permission)

74-0285. Ang, C. Y. W.; Dugan, L. R., Jr. (Food Sci. Ass., Inc., Dobbs Ferry, NY 10522). **Distribution of dieldrin in milk fractions.** *J. Food Sci. 38(5): 791-795; 1973.* (18 references)

Dieldrin in milk contaminated naturally and artificially with the pesticide had a distribution which closely correlated with the total lipid content. Whole milk, cream, skim milk, butter, and butter oil contained comparable concentrations of dieldrin on a lipid basis, but refined buttermilk and butter serum, which had higher levels of phospholipid, contained lower dieldrin residues. In unwashed cream from milk containing physiologically incorporated pesticide, 84.74% of the lipid and 84.78% of the dieldrin were found. At the membrane levels of the milk system concentrations of dieldrin in the total lipid were comparable although pellets contained different levels of phospholipid and free and bound lipid.

74-0286. Morishita, T. (Tokyo Educ. Univ., Tokyo, Japan). **[Soil contamination.]** *Kagaku Kogyo (Chem. Ind.) 23(10): 1322-1327; 1972.* (Japanese)

Large quantities of arsenate and copper sulfate pesticides are used in apple and orange orchards outside Yokohama. The topsoil of orchards has a considerable accumulation of arsenic and copper. For instance, 500 ppm of arsenic and more than 200 ppm of copper have been detected in the topsoil of a 50-year-old apple orchard in Aomori. These metals cause increased metal ion concentration in soil which in turn will increase the metal absorption by the roots of produce.

74-0287. Yamaberi, M.; Yano, H.; Shinmyo, N. (Kagawa Agr. Exp. Sta., Takamatsu, Japan). **[Persistence of organochlorine pesticides in soil and crops. I. Absorption and translocation of aldrin and dieldrin in strawberries.]** *Kagawa-ken Nogyo Shikenjo Kenkyu Hokoku (Bull. Kagawa Prefect. Agr. Exp. Sta.) 22: 36-42; 1972.* (5 references) (Japanese)

Absorption and movement of aldrin and dieldrin residues in soil and produce were examined in strawberry plants and fruit. The pesticide concentration in the pots of soil was 0.3, 1, 3, 30, and 100 ppm, respectively. Three plants were potted in each and the residues in the plants examined on the 75th and the 110th day. Similar tests were conducted in seedling beds and at the nurseries of two professional strawberry growers. In general, the amount of residue was greatest in roots, then stem and leaves, and lastly fruit. Residues in the root and stem-leaves tended to be higher with higher pesticide concentration in the soil. The difference was slight between 3-30 ppm, but residues increased drastically above that level of concentration. Residue in fruit was less than 0.001 ppm for aldrin and 0.004 ppm maximum for dieldrin. The rate of aldrin changing into dieldrin was: in soil, 10% in 1 ppm concentration, 2.5% in 100 ppm concentration; for stem-leaves, 90% in 0.3 ppm concentration and 58% in 100 ppm concentration; for roots, 86% for 0.3 ppm concentration and 15% in 100 ppm concentration. The residue transformation rate decreased when the concentration of aldrin in the soil was higher. The absorption rate of stem-leaves was lower with the higher concentration of aldrin-dieldrin concentration in the soil, but the absorption rate in the root was higher. However, for more than 3 ppm concentration, the root seemed to be saturated. Residue movement seemed to be very much affected by evaporation and dispersion of residues from the stems and leaves.

74-0288. Trofimova, M. G.; Mitrofanov, A. M. (Ye. P. Martsinovskiy Inst. Med. Parasitol. Tropical Diseases, USSR Min. Pub. Health, Moscow, USSR). **Vliyaniye granulirovannogo DDT, primenyayemogo dlya bor'by s komarami, na vodnyye organizmy (predvaritel'nyye dannyye). [Effect of granulated DDT, used for mosquito control, on aquatic organisms (preliminary report).]** *Med. Parazitol. Parazit. Bolez. 41(5): 620-622; 1972.* (12 references) (Russian)

DDT residue levels in surface and bottom water, aquatic plants, and sediments of a reservoir following aerial distribution of 5 kg 10% granulated DDT per ha for mosquito control were determined by thin-layer chromatography. During the first 1-30 days after DDT application, the surface layer of the water and aquatic plants did not contain traces of DDT. Levels in the benthic layer of the water were 0.001, 0.003, and 0.007 mg/l. on the 10th, 20th, and 30th days. The DDT levels in benthic silt on the 1st, 10th, 20th, and 30th days after application were 0.5, 0.8, 1.1, and 0.9 mg/kg. Organisms distributed in the bulk of the water (*Copepoda* and *Cladocera*) were beyond the zone of the toxic effect of granulated DDT, whereas benthic populations of *Chironomidae* died after DDT application.

74-0289. Staerk, H.; Suess, A. (Bayerische Landesanstalt fuer Bodenkultur und Pflanzenbau, Munich, Germany). **Bromgehalte von Gemuesepflanzen verschiedener Herkunft. [Bromine concentrations of vegetable plants of various origins.]** *Nachrichtenbl. Deut. Pflanzenschutzdienstes 25(6): 87-91; 1973.* (8 references) (German)

The natural bromine levels and bromine residues due to previous soil treatment with Terabol (methyl bro-

mide) and other bromine compounds were determined by nondestructive neutron activation analysis in domestic and imported vegetable plants including cabbage, red cabbage, cauliflower, bean, endive, cucumber, kohlrabi, lettuce, parsley, celery, radish, chive, leek, spinach, tomato, onion, and savoy cabbage. The natural bromine content in vegetables grown in different types of soils was almost always below 2 ppm in fresh matter. Treatment with Terabol resulted in bromine residue levels varying from 10 to 200 times the background concentrations, averaging some 50 ppm in fresh matter. The rate of bromine uptake by the plants decreased with the time elapsed from the date of fumigation. The bromine level fell to the natural content in 1 to 3 years. The bromine residues were highest in fast-growing species such as spinach, radish, and lettuce grown immediately after treatment. Preliminary soil disinfection with Terabol seemed not to cause an increase in the bromine content in plants such as kohlrabi.

74-0290. Suzuki, Y.; Sugaya, H.; Sasaki, S. (Inst. Rural Med., Akita Prefect. Koseiren, Hiraga Hospital, Hiraga, Japan). **[Results of 3 years' tracing investigation of organochlorine pesticide residues in humans.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 276-277; 1973.* (Japanese)

Organochlorine pesticide residues in human milk, human adipose tissues, and in several organs have been traced since 1970. The average residue concentration of α-, β-, γ-BHC, DDE, *o,p'*-DDE, *p,p'*-DDT, and dieldrin in milk was: 0.140, 0.650, 0.080, 2.200, 0.160, 1.170, and 0.380 in 1970; 0.060, 3.200, trace, 2.480, nondetectable, 0.830, and 0.208 in 1971; and trace, 6.105, trace, 2.768, 0.737, and 0.289 ppm in 1972. Only the conspicuous increase of β-BHC was noticed. The average residue concentration of these pesticides in adipose tissue was 0.099, 2.296, 0.025, 3.244, 0.098, 0.760, and 0.163 in 1970; 0.027, 2.958, 0.016, 1.268, 0.061, 0.600, and 0.208 in 1971, and 0.036, 3.916, 0.016, 2.822, 0.056, 0.797, and 0.429 ppm in 1972. The same trend of increasing β-BHC was noticed. The content of DDT decreased in both milk and adipose tissue. Residues were detected in brain, liver, kidney, and spleen in 1970 and 1972; the concentration was largest in kidney followed by liver, spleen, and brain. The results show that the incorporation and the excretion of the organochlorine pesticides are in equilibrium, suggesting the continuation of human pollution by organochlorine pesticide residue and the necessity of continuing the investigation.

74-0291. Kawanishi, A.; Asanuma, S.; Nakamura, S. (Japan Inst. of Rural Med., Usaga, Japan). **[Studies on the organochlorine pesticide residues in humans. Report 4.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 278-279; 1973.* (Japanese)

Organochlorine pesticide residues were investigated in human adipose tissue and their distribution studied in liver, kidney, adipose tissue, and mesentery in 1973. Of the 60 specimens of adipose tissue, the average concentration of α, β, γ, and δ-BHC, *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD, and dieldrin was 0.089, 2.517, 0.040, 0.013, 1.357, 0.060, 4.415, 0.097, and 0.129 ppm, respectively. That of total BHC was lower than the 1971 and 1972 values but that of total DDT was higher than that of 1972 and lower than that of 1971. The relative residual concentration of organochlorine pesticides in the kidney, subcutaneous fat, and the mesentery, as compared to that in the liver (with a value of 1) was 0.67 ± 0.18, 0.29 ± 0.05, and 0.21 ± 0.007 total BHC; 25.10 ± 4.79, 23.08 ± 4.74, and 5.71 ± 1.08 total DDT; and 20.30 ± 3.52, 18.80 ± 3.36, and 4.34 ± 1.00 dieldrin, respectively, showing the smaller residue content in the liver and the kidney than the subcutaneous fat and the mesentery.

74-0292. Abe, J.; Takamatsu, M. (Sch. of Environ. Hyg., Fac. Med., Kurume Univ., Kurume, Japan). **[The relationship between the organochlorine pesticide residues and PCB residue in humans.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 280-281; 1973.* (Japanese)

Organochlorine pesticide residues and PCB residues were determined in the plasma collected from 27 residents of western Japanese cities, 29 rural residents, 15 persons living around a pesticide factory, 11 women in labor, and 15 adult and 1 young patient with PCB intoxication from contaminated vegetable oil. PCBs, β-BHC, *p,p'*-DDT and *p,p'*-DDE were detected in all the specimens with the distribution and concentration of β-BHC and total DDT being wider than that of PCB. The β-BHC content was higher in urban residents than in rural residents, 12.2 and 9.3 ppb. No differences in the total DDT content were found between urban and rural residents. The β-BHC content in the plasma of residents around the pesticide factory was significantly higher than that of rural residents and not so different from that of urban residents. The β-BHC and total DDT contents of rural women in labor were lower than those in urban residents; however, the content of PCB was not different from that of normal persons. In healthy persons the contents of organochlorine pesticide residues and that of PCB in plasma were not correlated. However, some patients intoxicated by PCBs had high levels of PCB β-BHC, and also total DDT. The β-BHC content was significantly higher in men than in women.

74-0293. Savage, E. P.; Tessari, J. D.; Malberg, J. W.; Wheeler, H. W.; Bagby, J. R. (Inst. Rural Environ. Health, Dept. Microbiol., Coll. Vet. Med. Biochem. Sci., Colorado State Univ., Fort Collins, CO 80521). **Organochlorine pesticide residues and polychlorinated biphenyls in human milk, Colorado—1971-72.** *Pestic. Monit. J. 7(1): 1-5; 1973.* (8 references)

Organochlorine pesticide residues and PCBs were determined in 40 human milk samples collected from

women in rural Colorado during 1971-72. The highest levels found were of *p,p'*-DDE which ranged from 19 to 386 ppb; *p,p'*-DDT ranged from 7 to 109 ppb. β-BHC, *o,p'*-DDT, dieldrin, heptachlor epoxide, and *p,p'*-DDD ranged from a trace to 38, 13, 11, 5, and 5 ppb, respectively; PCBs ranged from 40 to 100 ppb. *p,p'*-DDE and *p,p'*-DDT were found in all milk samples, β-BHC in 87.5%, and PCBs in 20%. (Author abstract by permission)

74-0294. Borthwick, P. W.; Duke, T. W.; Wilson, A. J., Jr.; Lowe, J. I.; Patrick, J. M., Jr.; Oberheu, J. C. (Gulf Breeze Environ. Res. Lab., EPA, Gulf Breeze, FL 32561). **Accumulation and movement of mirex in selected estuaries of South Carolina, 1969-71.** *Pestic. Monit. J. 7(1): 6-26; 1973.* (9 references)

In conjunction with a fire ant eradication program during which mirex was aerially applied to coastal areas near Charleston, S. C., field studies were conducted to monitor the movement and accumulation of mirex in the estuarine system. Collections of background and periodic posttreatment samples of water, bottom sediments, shrimp, crabs, fish, and estuary-dependent birds and mammals were analyzed for mirex using electron-capture gas chromatography. The data revealed that (1) mirex was translocated from treated lands and high marsh to estuarine biota—all animal classes sampled contained mirex: and (2) biological concentration of mirex occurred—especially in predators such as raccoons and birds. Mirex residue ranges for respective sample categories were: water (< 10.01 ppb); sediment (0-0.7 ppm); crabs (0-0.60 ppm); fishes (0-0.82 ppm); shrimp (0-1.3 ppm); mammals (0-4.4 ppm); and birds (0-17.0 ppm). No mass mortalities were observed during the study. (Author abstract by permission)

74-0295. Faber, R. A.; Hickey, J. J. (Dept. Wildl. Ecol., Univ. Wisconsin, Madison, WI 53706). **Eggshell thinning, chlorinated hydrocarbons, and mercury in inland aquatic bird eggs, 1969 and 1970.** *Pestic. Monit. J. 7(1): 27-36; 1973.* (33 references)

In the Upper Great Lakes States 9 out of 13 species of fish-eating birds were found in 1969-70 to have sustained statistically significant decreases in eggshell thickness since 1946. Maximum changes in a thickness index occurred in great blue herons (−25%), red-breasted mergansers (−23%), common mergansers (−15%), and double-crested cormorants (−15%). Heron eggs taken in Louisiana generally displayed a smaller post-'46 change than herons in the Middle West. On a lipid basis, mean PCB- and DDE-residue levels exceeded 100 ppm in 7 out of 13 species in the Great Lakes States, and in 2 of 7 species in Louisiana, the average DDE:PCB ratios in the two regions being 1.25:1 and 3.9:1, respectively. Individual dieldrin values tended to be higher in Louisiana (31.6 and 13.95 ppm in heron species from two different locations), although values reached 10.1 and 9.4 ppm in great blue and black-crowned night herons in Wisconsin. BHC averaged 3.01 and 0.39 ppm in the Lake States and Louisiana, respectively. Of eggs examined for mercury, 29% had levels greater than 0.5 ppm, and 9%, greater than 1.0 ppm on a wet-weight basis. Mercury levels in a small sample of eggs from Louisiana were consistently low. The differences in mercury levels between the two regions thus were similar to those found for the chlorinated hydrocarbons. While DDE was a prominent factor for most groups, especially herons, in relation to the eggshell thinning observed, dieldrin was also important to two groups even though DDE was present in much higher amounts. PCBs were also important to mergansers, while mercury was positively correlated with thickness index in grebes and negatively correlated in mergansers. (Author abstract by permission)

74-0296. Holden, A. V. (Freshwater Fish. Lab., Pitlochry, Scotland). **International cooperative study of organochlorine and mercury residues in wildlife, 1969-71.** *Pestic. Monit. J. 7(1): 37-52; 1973.* (3 references)

A two-part collaborative study of organochlorine pesticides, polychlorinated biphenyls (PCBs), and mercury residues was carried out by 26 laboratories in 12 countries. The first part involved the analysis of three test samples containing organochlorine residues and one group of test samples containing mercury. One organochlorine sample contained seven pesticides or derivatives added to corn oil; a second was a standard solution of a PCB formulation in hexane; and the third a homogenate of cormorant (*Phalacrocorax carbo*) muscle containing mainly PCBs. With few exceptions, agreement among the analysis involved was reasonably good and acceptable for monitoring wildlife residues. Coefficients of variation for the various organochlorines were from ± 10% to ± 17%. The test samples containing mercury included a group of freeze-dried homogenates of the muscle tissue of pike (*Esox lucius*) and an ampoule of methylmercury dicyandiamide in water; the samples were analyzed for total and methylmercury. Again, agreement was reasonably good, although only four laboratories reported total mercury values and eight, methylmercury values. The second part of the program required the sampling and analysis of several species of wildlife from both terrestrial and aquatic environments, including fish, shellfish, and the eggs of birds. Samples were taken in specified numbers and at specified times, from both areas considered to be free of any pesticide usage and areas known or believed to be seriously polluted. Eggshell thickness indices were also determined. The results of the wildlife analyses demonstrated the difficulties in selecting species appropriate for international monitoring programs, in identifying (before analysis) areas of high contamination, and in relating concentrations to measurable biological effects. Samples of any one species from areas regarded as unpolluted in different countries

contained a wide range of organochlorine concentrations. The PCB levels in mussels from such areas contained 0.01 to 0.67 mg/kg, and DDE levels in herring ranged from < 0.01 to 0.30 mg/kg. The differences between residue results for samples in this second part of the study were much greater than the analytical variations estimated from the first part of the study. (Author abstract by permission).

74-0297. Klaassen, H. E.; Kadoum, A. M. (Div. Biol., Kansas State Univ., Manhattan, KS 660506). **Pesticide residues in natural fish populations of the Smoky Hill River of Western Kansas – 1967-69.** *Pestic. Monit. J. 7(1): 53-61; 1973.* (14 references)

Fish populations from five locations in an area of low pesticide use are described, and their pesticide residue levels are given for the 3-year period, 1967-69. The study was carried out in a dry-land farming area with developing irrigation on the Smoky Hill River of west central Kansas. Fish samples were collected by electroshocking at five stations along an 80-km section of the river. A total of 393 samples of the commonly occurring species (whole body, flesh, gonads) were analyzed for organochlorine residues. During the 3 years 24 species of fish were collected; 15 of these species were common in the study area. The number of species, number of individuals collected, and species diversity are presented for each station with respect to time. No endrin, aldrin, or heptachlor residues were detected in any sample. Heptachlor epoxide was found in trace amounts in three samples. Dieldrin was present in 15% of the samples, usually in amounts less than 0.01 ppm. DDT and its metabolites were detected in 75% of the samples, usually at only several hundredths of a part per million. The fish populations collected were considered "clean" from pesticides when compared with fish from other surveys. These data form a baseline for future comparison as the agriculture changes in this area. (Author abstract by permission)

74-0298. Longcore, J. R.; Mulhern, B. M. (Patuxent Wildl. Res. Cent., Laurel, MD 20810). **Organochlorine pesticides and polychlorinated biphenyls in black duck eggs from the United States and Canada – 1971.** *Pestic. Monit. J. 7(1): 62-66; 1973.* (10 references)

Black duck (*Anas rubripes*) eggs were collected in 1971 from the northeastern United States and Canada. All 61 eggs analyzed contained DDE residues; the mean DDE residues for States and Provinces ranged from 0.09 to 5.94 ppm on a wet-weight basis, with mean concentrations exceeding 1.0 ppm in eggs from Maine, New York, New Jersey, and Delaware. The highest DDE concentration, 14.0 ppm, was in an egg from Delaware. DDD (TDE) and DDT residues averaged < 0.5 ppm for each collection area. No mirex residues and only trace amounts of dieldrin and heptachlor epoxide were detected. Of the 61 eggs, 57 contained PCBs; mean PCB residues ranged from < 0.05 ppm in samples from Nova Scotia to 3.30 ppm in those from Massachusetts, with trace amounts occurring in nearly half the samples. Mean organochlorine pesticide residues appeared to be lower in the 1971 samples than in those analyzed in an earlier study in 1964. The shells from the 61 eggs were measured for thickness. Comparisons of the shell thickness of eggs collected in 1971, 1964, and prior to 1940 showed that the average thickness of shells from eggs collected in 1964 (0.321 mm) was significantly less ($P<0.01$) than that of shells of eggs collected prior to 1940 (0.348 mm) or in 1971 (0.343 mm). (Author abstract by permission)

74-0299. Martin, W. E.; Nickerson, P. R. (Div. Ecol. Serv., Bur. Sport Fish. Wildl., U.S. Dept. Interior, Twin Cities, MN 55111). **Mercury, lead, cadmium, and arsenic residues in starlings – 1971.** *Pestic. Monit. J. 7(1): 67-72; 1973.* (11 references)

Starlings (*Sturnus vulgaris*) collected in 1971 at 50 sites throughout the contiguous United States were analyzed for mercury, lead, cadmium, and arsenic residues. Except for one sample containing 0.62 ppm, mercury levels were generally well below 0.5 ppm with 76% at 0.05 ppm or less. Lead levels ranged from 0.12 to 6.6 ppm; cadmium residues ranged from "not detected" to 0.24 ppm with 72% at 0.05 ppm or less; and arsenic levels were quite low with only one sample (0.21 ppm) exceeding 0.05 ppm. (Author abstract by permission)

74-0300. Schulze, J. A.; Manigold, D. B.; Andrews, F. L. (Water Resour. Div., U.S. Geol. Surv., U.S. Dept. Interior, Austin, TX 78701). **Pesticides in selected western streams – 1968-71.** *Pestic. Monit. J. 7(1): 73-84; 1973.* (9 references)

This paper presents data from the U.S. Geological Survey program for monitoring pesticides in the streams of the western United States for the period October 1968 to September 1971. Data for the previous 3 years of the study were published in earlier issues of the *Pesticides Monitoring Journal.* Compounds determined include the common chlorinated insecticides and herbicides. Heptachlor and its epoxide were not detected during the 3-year period, and aldrin was found only once. DDT was the most frequently occurring insecticide, and 2,4,5-T the most common herbicide. The amounts observed were small; the maximum concentration of an insecticide was 0.46 μg/liter for DDT, and of an herbicide 0.99 μg/liter for 2,4-D. Concentrations were highest in water samples containing appreciable amounts of suspended sediments. Graphs are included to show insecticide and herbicide occurrences for the 4-year period (October 1967-September 1971) during which all 20 monitoring stations have been in operation. Beginning in July 1970, the phosphorothioate insecticides-parathion, methyl parathion, malathion, and diazinon–were determined monthly on all samples. Malathion was not found

during this period. Polychlorinated biphenyl (PCBs) compounds which were monitored beginning in October 1969 were also detected at two stations. (Author abstract by permission)

74-0301. Cotton, D.; Herring, J. (Mississippi Game & Fish Comm., MS). **A preliminary survey of pesticide residues in whitetail deer. (*Odocoileus virginianus*).** *IN: Proceedings of the Twenty-Fourth Annual Conference, Southeastern Association of Game and Fish Commissioners, J. W. Webb, ed., Columbia, S C, 1970, pp. 23-30.* (7 references)

Deer collected from the Mississippi Delta region had residues of *p,p'*-DDT, *p,p'*-TDE, and *p,p'*-DDE in flesh, fat, and liver. Trace amounts of toxaphene and endrin were found in some samples. None of the other organochlorine pesticides which could be detected by the method used were observed. Average total DDT levels in fat from each of the three areas surveyed were 1.658, 1.045, and 0.712 ppm, all below the FDA tolerance allowed in domestic livestock. Residues seemed to increase with age of the deer and were presumed to be obtained from browse contaminated during spraying operations and from sprayed agricultural crops like cotton and soybean.

74-0302. Barrier, M. J.; Reed, J. K.; Webb, L. G. (Dept. Biol., Baptist College at Charleston, Charleston, SC 29411). **Pesticide residues in selected tissues of the white-tailed deer, *Odocoileus virginianus*, in Calhoun County, SC.** *IN: Proceedings of the Twenty-Fourth Annual Conference, Southeastern Association of Game and Fish Commissioners, J. W. Webb, ed., Columbia, SC, 1970, pp. 31-45.* (20 references)

Analysis of pesticide residues in white-tailed deer from a leading cotton and soybean producing area in Calhoun County, S.C., revealed the presence of only DDT and its metabolites. Fat contained the highest residues (1.76 ppm), followed by brain, feces, rumen contents, liver, loin muscle, kidney, and rump muscle. None of the residues exceeded the 7.0 ppm maximum tolerance for beef established by the U.S.F.D.A., but in height of the spray season one sample of fat contained 6.67 ppm. Maximum levels were observed at the end of the spray season (July-September), and a secondary peak occurred in the early spring. Significant differences were not observed between levels in males and females, but higher residues were found in older, heavier animals. Most of the material was present as *p,p'*-DDT and TDE, and only low levels of DDE and *o,p'*-DDT were detected.

74-0303. Williams, L. E., Jr.; Martin, L. L. (Game Fresh Water Fish Comm., Wildlife Res. Projects, Gainesville, FL 32601). **Nesting populations of brown pelicans in Florida.** *IN: Proceedings of the Twenty-Fourth Annual Conference, Southeastern Association of Fish and Game Commissioners, J. W. Webb, ed., Columbia, SC, 1970, pp. 154-169.* (8 references)

Tissues of brown pelicans examined from representative colonies during a census in Florida contained significant residues of DDE. Egg shells of these birds have been reported to be abnormally thin. Although adult populations have remained at the same level over a 3-year period, the data did not reveal whether or not reproduction is normal and can sustain the level. California pelicans have experienced a decline attributed to DDT contamination.

74-0304. Oberheu, J. C. (Bur. Sport Fish. Wildlife, Atlanta, GA). **Effects on fish and wildlife of heptachlor applied to eradicate the sugarcane root weevil in Apopka, FL.** *IN: Proceedings of the Twenty-Fourth Annual Conference, Southeastern Association of Fish and Game Commissioners, J. W. Webb., ed., Columbia, SC, 1970, pp. 194-200.* (10 references)

Residues were studied following treatment with heptachlor (10% granules at 30 lb/acre) in Apopka over a 4-wk period. A 10-fold increase in heptachlor epoxide in sparrow brains and a 40-fold increase in sparrow carcasses 20 days after initiation of treatment and marked decreases in residues of DDT and its metabolites were found in these birds. The carcass level of heptachlor epoxide averaged 6.91 ppm, a level sufficient to make the birds unfit as food for raptors. Earthworms sampled 30 to 60 days after treatment showed an increase from 0.01 to 0.04 ppm, and levels in fish and aquatic invertebrates taken from a city lake, excluded from treatment, did not change significantly. Dead birds were found in the citrus groves searched, and six analyzed for residues had brain levels high enough to have caused death.

74-0305. Herring, J.; Cotton, D. (Mississippi Game & Fish Comm., MS). **Pesticide residues of twenty Mississippi delta lakes.** *IN: Proceedings of the Twenty-Fourth Annual Conference, Southeastern Association of Game and Fish Commissioners, J. W. Webb, ed., Columbia, SC, 1970, pp. 482-488.* (6 references)

DDT and its metabolites and toxaphene were the only organohalide pesticides found in 20 randomly selected Mississippi Delta lakes. The four lakes behind the levee contained low levels of the insecticides in water, bottom sediments, and fish. Of the remaining lakes, 10 were considerably polluted with DDT and toxaphene. Lake water residues were generally low and less consistent than those of bottom sediments; the latter were 0.02 to 3.58 ppm DDT plus metabolites and 0.0 to 2.47 ppm toxaphens. Residues of total DDT and toxaphene in fish flesh were 0.15 to 10.60 ppm and 0.0 to 20.0 ppm, respectively.

74-0306. Antsiferov, S. D.; Makarov, V. A.; Zhavoronkov, N. I. (All-Union Inst. Exp. Vet., USSR). **Otsenka**

myasa zhivotnykh pri otravlenii sevinom. [Appraisal of the meat of carbaryl-poisoned animals.] *Veterinariya (Moscow) 10: 110-112; 1972.* (Russian)

Carbaryl residue dynamics were studied in different organs of sheep, rabbits, and hogs poisoned with single, oral doses of this pesticide to study the effects of freezer storage and cooking on the residue contents in meat from these animals. Hogs and rabbits received 500 mg/kg and sheep 200 mg/kg doses of carbaryl. Carbaryl residues in muscles, liver, and kidneys of sheep and rabbits persisted for 15 and nearly 7 days; carbaryl residues investigated one day after poisoning in sheep muscles, liver, and kidneys, were 17.2, 27.6, and 23 mg/kg. The corresponding values for rabbits were 9.9, 17.5, and 12.6 mg/kg. Carbaryl residues determined in muscles, liver, and kidneys of sheep after 15 days, and those organs in rabbits after 3 days were 0.9, 0.9, and 1.0 mg/kg and 1.2, 2.2, and 2 mg/kg. The initial carbaryl concentrations of 32.6, 22.6, and 22.2 mg/kg, present in two mutton samples and one pork sample, fell to 11.0-15.0 mg/kg during freezer storage for 14 months. Cooking this meat for two hours failed to reduce carbaryl residues.

74-0307. Vorob'yeva, N. M.; Lapchenko, V. S. (Kiev Sci. Res. Inst. Food Hyg., Kiev, USSR). **Ob ostatochnykh kolichestvakh amifosa v pishchevykh produktakh. [Amiphos residues in food products.]** *Vop. Pitan. 32(4): 71-72; 1973.* (3 references) (Russian)

Amiphos residues in apples, beets, and peas were determined by colorimetry 2 to 20 days after treatment with amiphos. The amiphos expenditures used for the treatment of beets and peas were 4 and 6 kg/ha as well as 3-4 kg/ha, respectively, while apple trees were treated with 0.2% amiphos solution. The amiphos residues determined in beet roots 2, 3, 5, 8, and 10 days after amiphos treatment were 1.24-1.5, 0.65-0.8, 0.4-0.5, 0.6-0.7, and 0.4-0.5 mg/kg, respectively. The corresponding residue contents in apples were 1.9, 1.5, 1.2, and 0.7 mg/kg. In peas, the amiphos residue levels fell from 0.5-0.7 mg/kg during the first few days after treatment to 0.5 mg/kg on the 10th day. Amiphos residues in apples, beet roots, and peas were not detected 20 days after treatment.

74-0308. Tokutsu, K.; Koyama, T.; Yokoyama, T. (Wakayama Prefect. Inst. Pub. Health, Wakayama, Japan). **[Pesticide residue in mother's milk and plasma in Wakayama Prefecture.]** *Wakayama-Ken Eisei Kenkyusho Nenpo (Annu. Rep. Wakayama Prefect. Inst. Pub. Health) 19: 59-62; 1970.* (1 reference) (Japanese)

Samples of milk and plasma of five mothers from a city, three mothers from an agricultural village, and two mothers from a small town in Wakayama Prefecture were taken for gas chromatographic analysis of BHC and DDT residues. Geographical variations and comparisons with the residues in cow's milk were observed. All samples contained residues of BHC and DDT in various amounts except that δ-BHC and *p,p'*-DDD (TDE) were not always present. In general, β-BHC was detected at especially high levels, with the maximum residue of 0.250 ppm in the city and the minimum of 0.035 ppm in the village; the average was 0.105 ppm. However, all samples had less than the government standard for cow's milk, 0.35 ppm, and the average was also less than the total Japan average of 0.121 ppm which was reported after the May 31, 1971, investigation. The relative DDT content was 0.128 ppm maximum (city) and 0.04 ppm minimum (village), with an average of 0.071 ppm. Here, 50% of the samples had more than the government standard of 0.07 ppm. Compared to the all-Japan average of 0.056 ppm, it seemed rather high. The result corresponded with the high DDT residue in cow's milk (reported previously), and dietary contamination was suspected. There were no residues of **aldr**in or endrin, but five samples out of ten had dieldrin residues; two exceeded the government standard of 0.005 ppm. All plasma samples also contained residues of all pesticides studied. The β-BHC level was 0.025 ppm maximum (city), 0.007 ppm minimum (city and village), with average of 0.013 ppm. Relative DDT was detected at a maximum of 0.02 ppm (village) and minimum of 0.005 ppm (city), with the average of 0.011 ppm. The total-BHC average in the city was 0.15 ppm, twice the village average. Relative DDT averages were 0.074 ppm in the city and 0.064 ppm in the village. This also confirmed the suspicion of dietary contamination.

74-0309. Koyama, T.; Tokutsu, K.; Yokoyama, T. (Wakayama Prefect. Inst. Pub. Health, Wakayama, Japan). **[An investigation of organochlorine pesticide residue in milk.]** *Wakayama-Ken Eisei Kenkyusho Nenpo (Annu. Rep. Wakayama Prefect. Inst. Pub. Health) 19: 62-65; 1970.* (2 references) (Japanese)

The results of four 1970 inspections of cow's milk (unprocessed) in various areas of Wakayama Prefecture are presented. The highest β-BHC residue was 0.560 ppm, and the maximum total DDT was 1.138 ppm. Both measurements were from the first inspection, in April. The inspection results in June, September, and December showed improvements in the BHC level. β-BHC in particular eventually dropped far below the government standard of 0.2 ppm. However, the level of DDT residue is still high. The high DDT residue is one of the characteristics of untreated milk from Wakayama. Southern Wakayama always had relatively low BHC and high DDT residues. In northern Wakayama both BHC and DDT residues were high, but BHC gradually decreased, although it is still high compared to southern Wakayama. The pesticide residue in straw is extremely high. The maximum total-DDT level in straw was 30.198 ppm, and that of BHC (total), 14.933 ppm. Samples of mixed feed had maximum total-BHC residues of 0.296 ppm, with 0.254 ppm in wheat; hay contained 0.268 ppm of total-DDT. Evidently, these feed materials contributed to the high level of pesticide residues in cow's

milk. Cattle feed contained equal amounts of BHC-isomers, but raw milk contained only a small amount of α-BHC (lindane) and a large amount of β-BHC. In feed, *p,p'*-DDT was detected in large quantities; in raw milk, high residues of *p,p'*-DDE and *p,p'*-DDT were detected. Of the market milk samples processed by large manufacturers, one sample contained 0.263 ppm of β-BHC which was well over the government standard of 0.2 ppm. Another sample contained 0.432 ppm of total-DDT, which was eight times more than the government's DDT residue standard.

74-0310. Wang, W. C.; Lee, G. F.; Spyridakis, D. (Illinois State Water Survey, Peoria, IL). **Adsorption of parathion in a multicomponent solution.** *Water. Res. 6(10): 1219-1228; 1972.* (15 references)

Adsorption of parathion on different clay minerals in aqueous suspension was enhanced by Rhodamine B, but not methylene blue. The amount of parathion adsorbed increased with increasing Rhodamine B:clay ratio regardless of particle size, and a 6-fold increase in parathion adsorption was noted at 2.4 mg Rhodamine B/g of clay (0.3 - 1μm). Phenol had a slight inhibitory effect on adsorption. In both cases, equilibrium was reached within 1 hr. In contrast, lake sediments from which the organic matter was partially removed had increased parathion adsorption capacity. From 14 to 21% of the adsorbed parathion could be removed with distilled water, indicating a weak parathion-clay association.

74-0311. Fry, J. C.; Brooker, M. P.; Thomas, P. L. (Dept. Appl. Biol., Univ. Wales Inst. Sci. Technol., Cathay's Park, Cardiff, Wales). **Changes in the microbial populations of a reservoir treated with the herbicide paraquat.** *Water Res. 7(3): 395-407; 1973.* (33 references)

Application of paraquat at a rate of 1.0 mg/l. to a fishing reservoir resulted in the death of submerged angiosperms, primarily *M. spicatum* and *P. pectinatus*, and a subsequent growth of the macrophytic alga, *Chara* sp. The alga was chlorotic at first but did not die and was resistant to a second application of paraquat at 0.6 ml/l. Large increases in numbers of paraquat resistant microorganisms and their proportion in the total heterotroph polulation in the mud and water occurred after both applications, and these corresponded with peaks in paraquat residues in the two phases. In water, paraquat disappeared rapidly and was not detected after two weeks. Peak concentrations in the mud occurred on day 16; four months after the first spraying 40% of the applied paraquat was accounted for in the mud, most of it in the upper 3 cm. Increases in counts of viable heterotrophs and some exoenzyme-producing microorganisms were noted after the first application of paraquat and apparently corresponded with plant death, which did not occur after the second application.

74-0312. Davis, E. A.; Ingebo, P. A. (U.S.D.A. Forest Serv., Rocky Mountain Forest Range Exp. Station Forest Hydrol. Lab., Tempe, AZ 85281). **Picloram movement from a chaparral watershed.** *Water Resour. Res. 9(5): 1304-1313; 1973.* (30 references)

Picloram residues found in a stream at the outlet of a watershed treated over 4.5% of its area with pellets of the herbicide were highest during the first three months and declined to nondetectable levels within 14 months. Maximum concentrations measured were 350 to 370 ppb, and direct use of stream water from the outlet of the watershed when levels were between 46 and 370 ppb could have been detrimental to sensitive crops. After 40 inches of accumulated rainfall, when no picloram was observed in the stream, it was estimated that 4.5% of the applied material had been lost to the water.

74-0313. Molnau, M. P.; Lovely, W. G.; Johnson, H. P. (Dept. Agr. Eng., Univ. Idaho, Moscow, ID 83843). **Micromovement of propachlor from granules in soil.** *Weed Sci. 21(3): 185-188; 1973.* (8 references)

Movement of 2-chloro-*N*-isopropylacetanilide (propachlor) from a granule to the soil was classified as horizontal, below the granule, above the granule, and into an area within a 3-ppmw contour. The influence of depth of placement, moisture content, temperature, relative humidity, and exposure time on each of the movement classifications was determined. Horizontal movement increased as the temperature, moisture, and exposure time increased. Propachlor tends to move down into the soil under dry conditions and up when the soil is moist. The size of the soil area that contained 3 ppmw was greater for granules placed in the soil than for granules placed on the surface. The size of the area increased as the moisture increased. (Author abstract by permission)

74-0314. Harvey, R. G. (Dept. Agron., Univ. Wisconsin, Madison, WI 53706). **Influence of cropping and activated carbon on persistence of atrazine in sand.** *Weed Sci. 21(3): 204-206; 1973.* (10 references)

The persistence of 2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine (atrazine) residues under greenhouse conditions was affected by levels of activated carbon added to a silica sand potting medium and by up to four consecutive crops of corn (*Zea mays* L.). Degradation of atrazine within the sand and removal by the corn crops were both reduced by activated carbon. Atrazine removal by successive crops of corn reduced injury to oat seedlings grown on the sand alone, and absorption by 1.2 g of carbon per kilogram of sand prevented oat injury both with and without cropping. Although 0.4 g/kg of activated carbon inhibited atrazine removal by corn, oat seedlings were not protected from the residues remaining. When exposed to alternate freezing and thawing, the ability of 0.4 g/kg of activated

carbon to deactivate atrazine was reduced causing increased oat injury. (Author abstract by permission)

74-0315. Abernathy, J. R.; Wax, L. M. (Velsicol Chem. Corp., Chicago, IL 60611). **Bentazon mobility and adsorption in twelve Illinois soils.** *Weed Sci. 21(3): 224-226; 1973.* (4 references)

Investigations of the behavior of 3-isopropyl-1*H*-2, 1,3-benzothiadiazin-(4)3*H*-one 2,2-dioxide (bentazon) in water solutions have shown that it was anionic in neutral solutions by exhibiting a strong movement toward the anode in an electrical field. The herbicide was not adsorbed by any of twelve selected Illinois soils or by the cation exchange resin, carboxymethylcellulose (CMC), but was almost completely adsorbed by charcoal and by the anion exchanger, diethylaminoethylcellulose (DEAE). Bentazon moved with the water front on soil thin-layer plates as well as through soil columns. (Author abstract by permission)

74-0316. Savage, K. E. (Plant Sci. Res. Div., Agr. Res. Serv., Stoneville, MS 38776). **Nitralin and trifluralin persistence in soil.** *Weed Sci. 21(4): 285-288; 1973.* (9 references)

Analysis of soil samples taken periodically from field plots on Dundee silty clay loam treated with single or dual annual applications of 4-(methylsulfonyl)-2,6-dinitro-*N*, *N*-dipropylaniline (nitralin) or *α,α,α*-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine (trifluralin) at 0.84 or 1.68 kg/ha indicated dissipation of the herbicides to a low residual level within 3 to 4 months following each application. No accumulation was noted with either herbicide regardless of frequency or rate of application. Nitralin phytotoxicity to sorghum (*Sorghum bicolor* L. 'Dekalb 57E') decreased more rapidly in soil that had received prior treatment with nitralin than in soil with no previous treatment. A microbiological influence is suggested because this effect was nullified by autoclaving the soil prior to herbicide treatment. This effect was not apparent with trifluralin. A survey of 250 fields indicated a significant, inverse correlation between nitralin and trifluralin residue level and soil pH. Nitralin persistence was greater in acid than in neutral soil. (Author abstract by permission)

74-0317. Rahn, P. R.; Zimdahl, R. L. (Weed Res. Lab., Dept. Bot. Plant Pathol., Colorado State Univ., Ft. Collins, CO 80521). **Soil degradation of two phenyl pyridazinone herbicides.** *Weed Sci. 21(4): 314-317; 1973.* (8 references)

Degradation of SAN 6706 [4-chloro-5-(dimethylamino)-2-(*α,α,α*-trifluoro-*m*-tolyl)-3(2*H*)-pyridazinone] and SAN 9789 [4-chloro-5-(methylamino)-2-(*α,α,α*,-trifluoro-*m*-tolyl)-3(2*H*)-pyridazinone) was studied in a sandy loam soil at temperatures of 5, 20, and 35 C. After 210 days of incubation 10, 80, and 97% of SAN 6706 was converted to SAN 9789 and a demethylated metabolite in the soil. SAN 9789 was converted to the demethylated metabolite. It was difficult to differentiate between first and second-order kinetics in the degradation of these compounds. SAN 6706, at 20 and 35 C, had a half life of 50 and 9 days respectively, and an Arrhenius activation energy of 15.8 Kcal/mole. SAN 9789, at 20 and 35 C, had a half life of 270 and 70 days, respectively, and an activation energy of 11.8 Kcal/mole. The degradation of SAN 6707 was inhibited by a chloroform treatment, and microbiological degradation is suggested. (Author abstract by permission)

74-0318. Cc ...; Doglia, S. (Dept. Physics, Univ. Texas, Austin, ... 78712). **Concentration of pesticides slowly released by diffusion.** *Weed Sci. 21(4): 343-349; 1973.* (5 references)

The active concentration of a pesticide declines with time due to volatilization, absorption and translocation, microbial degradation, adsorption on soil particles and plant parts, chemical reactions, photodecomposition, and other reactions with the environment. However, slow-release formulations can provide a continuing input of pesticide. This leads to a rise and subsequent fall in the active concentration. Because diffusion is a factor in most controlled release methodologies, the concentration to be expected for release by diffusion of a substance, which then decays with time by a first order rate law, is examined theoretically. This provides guidance to the experimenter for separating the effects due to diffusion from those attributable to other and newer concepts such as water-degradable polymers. An approximate result of this exact solution is that the persistence of the substance can be increased. More precisely, the long-term behavior is like that of a more persistent pesticide with smaller first-order rate constant. (Author abstract by permission)

74-0319. Pesendorfer, H.; Eichler, I.; Glofke, E. (Bundesstaatliche Anstalt fuer experimentell-pharmakologische und balneologische Untersuchungen, Vienna, Austria). **Orientierende Untersuchungen ueber Rueckstaende an DDT, anderen Organochlorpestiziden und PCBs in Humanfettproben (aus dem Raum Wien). [Informative analyses of organochlorine pesticide and PCB residues in human adipose tissue (from the area of Vienna).]** *Wien. Klin. Wochenschr. 85(14): 218-222; 1973.* (54 references) (German)

Methods and results of residue analyses of *p,p'*-DDE, *p,p'*-DDT, dieldrin, BHC, lindane, and PCB in 32 human perirenal fatty tissue samples taken mostly from suddenly deceased subjects in the Vienna area are described. The samples were combined with celite and acetonitrile for final extraction with petroleum ether. In another preparative variant, the samples were triturated with kieselguhr and sand and extracted with petroleum

ether-ethanol mixture. The residue contents were determined gas chromatographically by comparison with standard solutions. The averages determined for *p,p'*-DDE, *p,p'*-DDT, dieldrin, BHC, lindane, and PCBs were 4.6 ppm, 1.2 ppm, 0.1 ppm, 1.9 ppm, 0.2 ppm, and 3.5 ppm. The highest DDE+DDT levels determined in adipose tissue and fat were 19.5 ppm and 25 ppm, respectively.

74-0320. Roszinski, H.; Herzel, F. (Inst. fuer Kulturtech. und Grunenlandwirtschaft im Fachbereich 14, Tech. Univ. Berlin, Berlin, Germany). **Verhalten und Wirkungen von umweltgefaehrdenden Stoffen in Muell-Abwasserschamm-Komposten. 2. Bericht: Abbau des Herbizide Simazin waehrend der Kompostrotte. [Nature and effect of environmental pollution substances in composts of refuse sewage sludge. Part 2: Degradation of the herbicide simazine during the process of decomposition.]** *Z. Kulturtech. Flurbereinig. 13: 304-310; 1972.* (6 references) (German)

The degradation of simazine during the post-composting of a fresh compost and another mature compost was studied by systematic sample analyses using gas chromatography and temperature measurements. By comparing the temperature curves and the simazine decomposition curves, a definite decrease in the simazine concentration in the composts as a function of the post-composting intensity was established. The rate of simazine decomposition, like the post-composting activity, was highest during the initial period of the post-composting process in both types of composts. Since the rotting intensity in fresh compost was both higher and more prolonged than in the mature compost, the diminution of the simazine concentration in the former was first more rapid and more persistent than in the mature compost pit. As the decomposition activity of the composts decreased, the simazine breakdown curves flattened distinctly. The simazine concentrations fell from about 50 ppm to over 10 ppm in 95 days in fresh compost and in 55 days in mature compost. The observed decrease in the simazine concentration in the composts does not justify the use of simazine for weed control in areas from which wastes may get into composts.

74-0321. Eichner, M. (Chemische Landesuntersuchungsanstalt, Offenburg, Germany). **Ueber Rueckstandsbestimmungen von chlorierten Insecticiden und polychlorierten Biphenylen in Fischen des Bodensees, des Oberrheins und dessen Zufluessen sowie in diesen Gewaessern. 1. Mitteilung. [Residue analysis of chlorinated pesticides and polychlorinated biphenyls (PCB) in fish and waters of Lake Constance and the upper Rhine and its tributaries. Part 1.]** *Z. Lebensm.-Unters.-Forsch. 151(6): 376-383; 1973.* (14 references) (German)

Heptachlor, heptachlor epoxide, endrin, chlordane, methoxychlor, phosphoric acid esters, and PCBs were detected; and BHC, lindane, dieldrin, endosulfan, DDT, TDE, DDE, and PCBs were quantitatively determined in a total of 130 fish specimens caught in Lake Constance, the Upper Rhine, and its tributaries in the Black Forest. Whitefish, perch, and eels from Lake Constance contained 0.02-0.52 ppm total BHC, 0.01-0.12 ppm aldrin, 0.03-0.28 ppm dieldrin, 0.04-0.21 ppm endosulfan, 0.06-0.59 ppm total DDT, and 0.03-1.2 ppm PCB. The pesticide residue levels in fish caught in quiet regions of the Lake were 5 to 10% higher than those in fish from sections through which the Rhine flows. Pesticide residues in Upper Rhine fish were lower than those in fish from Lake Constance, the former had elevated PCB levels. DDT and BHC depots increased from March to June in all species. Roach and trout from the Bleiche, Elz, Wiese, Kinzig, Bench, and Neckar (all tributaries of the Rhine) contained 0.03-0.32 ppm total BHC, 0.01-0.09 ppm aldrin, 0.01-0.1 ppm dieldrin, 0.02-0.30 ppm endosulfan, 0.03-0.48 ppm total DDT, and 0.05-3.9 ppm PCB. Trout caught in Black Forest creeks, especially in areas not used industrially and agriculturally, contained almost no pesticide and PCB residues.

74-0322. Weil, L.; Dure, G.; Quentin, K. E. (Inst. fuer Wasserchemie und Chem. Balneologie, Tech. Univ. Muenchen, Munich, Germany). **Adsorption von chlorierten Kohlenwasserstoffen an organischen Wassertruebstoffen und an Boeden. [Adsorption of chlorinated hydrocarbons on organic turbid matter in water and on soils.]** *Z. Wasser- Abwasserforsch. 6(4): 107-112; 1973.* (10 references) (German)

The adsorption of lindane, heptachlor epoxide, dieldrin, DDT, methoxychlor, and Clophen A 60 (PVB) on sodium humate in tap water and on clay mineral soil particles was studied. The adsorption rates and adsorption capacities of both adsorbents increased in the sequence lindane, heptachlor epoxide, dieldrin, methoxychlor, DDT, 3,4,3'-trichlorobiphenyl, 3,4,3',4'-tetrachlorobiphenyl and Clophen A 60. This sequence was independent of the type of the adsorbent. The ratio of the equilibrium constants determined for soil and sodium humate in water was 1:10. The rate of adsorption for DDT was about 1,000 times higher than that for lindane. While the equilibrium concentration in suspended sodium humate was reached in one hour, it needed about two weeks in soil. The adsorption heat for the DDT/humic acid system was about 2.5 kcal/mol. A model is given for the prediction of the adsorption capacity of different soils and suspended particles in surface waters.

74-0323. Fodre, S.; Imre, R. A.; Berencsi, G. (Inst. fuer Hyg., Med. Univ. Szeged, Szeged, Hungary). **Bedeutet die Anwendung von mit quecksilberhaltigen Pestiziden gebeizten Samen usw. in toxikologischer Hinsicht eine Gefaehrung fuer die Produkte der Spirituosenindustrie? [Is there a toxic hazard for alcoholic drinks in using seeds etc. treated with mercurial pesticides?]** *Zentralbl.*

Bakt. Hyg., I. Abt. Orig. B. 157: 333-336; 1973. (8 references) (German)

The possible hazards of mercury contamination of alcoholic beverages due to willful or negligent use of grains previously dressed with mercurial pesticides were studied with Higosan (methoxyethyl-mercury chloride, agallol). Distillation tests with model solutions of Higosan revealed that regardless of the initial mercury content in the solution, some 6% of the total mercury content is transferred into the distillate during distillation. The presence of substantial mercury residue levels in alconol distillates is impossible due to the fact that mercury concentrations of 3 μg/100 ml totally inhibit the fermentation process. Quantitative retention of mercury in the solution and practical absence of mercury in the sediment was observed in fermentation tests. While the maximum possible mercury residue content of 1.8 μg/l in distilled alcohol is not capable of producing harmful effect even in persons who regularly consume alcohol, alcoholic beverages should be free from traces of mercury.

See also 74-0257 74-0267 74-0269 74-0351 74-0407 74-0415 74-0419

74-0324. Baer, R. L.; Ramsey, D. L.; Biondi, E. (Dept. Dermatol., New York Univ. Med. Cent., New York, NY 10016). **The most common contact allergens.** *Arch. Dermatol. 108: 74-78; 1973.* (19 references)

During patch tests of a number of contact allergens in 200 or more patients selected for allergic contact dermatitis or other skin diseases, thiram caused a reaction in 7.9%, pyrethrum in 3.1%, and turpentine oil in 12.2% of the subjects. Reactions from pyrethrum and turpentine were generally of a + 1 and + 2 type; witl thiram five were + 1, two were + 2, eight were + 3, and three were + 4. Cross sensitizations have been reported for pyrethrum (turpentine, ragweed, and chrysanthemum oleoresins), thiram (tetramethylthiuram monosulfide and disulfiram), and turpentine (chrysanthemum, ragweed, pyrethrum, colophony, and pine, peru, and spruce balsams).

74-0325. Serat, W. F. (Community Studies on Pesticides, State Dept. Pub. Health, Berkeley, CA 94704). **Calculation of a safe reentry time into an orchard treated with a pesticide chemical which produces a measurable physiological response.** *Arch. Environ. Contam. Toxicol. 1(2): 170-181; 1973.* (10 references)

First order decreases in pesticide residues and plasma ChE levels, obtained during a study of workers in an orange grove treated with an organophosphate insecticide at 3-4 times the normal rate, were used to derive a mathematical equation for the calculation of a safe reentry time. Data was obtained on leaf residues at 2, 4, 8, and 26 days after application. Four days after application workers were allowed to enter treated fields where they were exposed for eight hours. Blood samples were taken one and five days later. Only results of plasma ChE determinations were used since RBC ChE was not altered by exposure in most cases. The safe reentry time determined by this method was 23.4 days, assuming a worker would spend five 8-hr days in the field and could experience a 30% drop in ChE without ill effects. Much shorter reentry periods would be obtained using the normal application rates.

74-0326. Cramp, S. (London, England). **The effects of pesticides on British wildlife.** *Brit. Vet. J. 129(4): 315-323; 1973.* (45 references)

Bird casualties attributed to pesticides have occurred in Britain since the 1950s, several years after the introduction of DDT and other organochlorines. Increases in bird and mammal kills were observed with the introduction of seed dressings of more potent compounds like aldrin and dieldrin. Because of the network of amateurs working with the Nature Conservancy in Britain, early indications of pesticide damage to wildlife were detected and voluntary agreements were made to curtail the use of implicated compounds. Declines in the number of kills and in the egg-shell thinning phenomenon have followed the discontinuation of such pesticides.

74-0327. Mellerio, F.; Gaultier, M.; Fournier, E.; Gerais, P.; Frejaville, J. P. (Toxicol. Cent., Fernand Widal Hosp., Paris, France). **Contribution of electroencephalography to resuscitation in toxicology.** *Clin. Toxicol. 6(2): 271-285; 1973.* (29 references)

Ten years of experience with the technique of electroencephalography in cases of acute intoxication by various substances indicates that insecticides, whether organochlorine, organophosphate, or associated chemicals, induce only a few modifications of the electroencephalogram, even in the presence of convulsions or obvious respiratory disorders. The procedure can be used, with some discretion, for diagnostic purposes and management of coma during intoxication with some drugs, carbon monoxide, and other substances.

74-0328. Nuritdinova, F. N. (Uzbek Sci. Res. Inst. Sanit., Hyg., Occup. Diseases, USSR). **Gidrodinamika glaz pri khronicheskikh intoksikatsiyakh pestitsidami. [The hydrodynamics of the eyes in chronic pesticide poisonings.]** *Med. Zh. Uzb. 4: 27-28; 1973.* (Russian)

One hundred eighty male and 60 female workers aged 30-50, with 7-20 years on the job, and who suffered from occupational poisoning with pesticides, were subjected to ophthalmological tests. The intraocular pressures measured by elastotonographic method were P5 = 13.5±0.2 mm, P10 = 20.2±0.2 mm, and PO = 12.2±0.25 mm. The corresponding values in a control group were 12.5±0.2 mm, 18±0.2 mm, and 11.2±0.22 mm. The aqueous humor minute volumes, as calculated for the test group and the control group, were 1.0±0.7, and 1.5±0.1. Glaucoma was established in 4.9% of 65 patients with pronounced deviation of the hydrodynamic parameters. Peripheral narrowing of the field of vision was found in 70.2%; dilation of the fovea and the optic disk, angiopathy of the retina, and chorioretinitis were found in 25.6% of all patients. Vegetative vascular dystonia, hepatopathy, and neurites of various localizations, characteristic symptoms of chronic pesticide poisoning, were found in 80.7% of the patients with disturbances of the intraocular pressure.

74-0329. Uchida, A. (Inst. of Rural Med., Chiba Univ., Chiba, Japan). **[Results of health examinations of pesticide applicators as seen by agricultural managers.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 182-183; 1973.* (Japanese)

The health of private farm managers from 106 households in a farming cooperative in Chiba Prefecture was examined twice, early in September 1972 and in the middle of February 1973. History of pesticide application and subjective symptoms due to pesticides were examined. General condition, blood pressure, blood values (hemoglobin, hematocrit, whole blood density, serum density, RBC, total protein), liver function, urine, and feces were studied. The frequency of high blood pressure, anemia, and abnormal liver function was com-

pared among managers of general farming, greenhouse culture, mushroom culture, chicken breeding, dairy farming, and swinery, and also among full-time and part-time farm workers. Incidence of these conditions was high in farms with domestic animals. Liver function and cholinesterase activity were more often normal in winter than in summer. The frequency of fatigue was higher again in farms with domestic animals and in greenhouse cultures. Although the frequency of acute intoxication by pesticide application was small, 9% in men and 6% in women, the number of pesticide applications was high (22.6 times for men and 9.5 times for women per year), especially in house-culture farms.

74-0330. Sugaya, H. (Group of Pesticide Poisoning Studies, Akita Prefect. Soc. Rural Med., Akita, Japan). **[Results of health examinations of cooperative groups of pesticide applicators during 5 years from 1968 to 1973 (Investigation of pesticide poisoning instances).]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 184-185; 1973.* (Japanese)

Pesticide poisoning of cooperative groups of pesticide applicators was studied since 1968 in Akita Prefecture. The percentage of people with subjective symptoms due to pesticide application decreased from 66.9 in 1968 to 35.7 in 1971; however, the percentage increased to 52.1 in 1972, although it is necessary to consider the change in major treated crops. The percentage frequency of subjective symptoms decreased from 33.9 in 1970 to 22.4 in 1972. These findings show that despite the gradual change in pesticides, about half of the pesticide users complain more than once every four months. Subjective symptoms due to pesticides were most often caused by herbicides followed by low acute toxicity organphosphorus pesticides, sulfur fungicides, organochlorine insecticides, then high acute toxicity organophosphorus insecticides. The frequency of application and that of subjective symptoms were parallel. Marked changes were not apparent during blood and liver function examinations.

74-0331. Nagata, H.; Izumiyama, T.; Kamata, K.; Takano, S.; Kobayashi, S.; Yamagishi, M.; Suzuki, K. (Hokushin Gen. Hosp., Nagano Prefect. Welfare Union, Nagano, Japan). **[A study on the health supervision of pesticide applying farmers from the results of health examinations of speed sprayer operators in the season.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 186-187; 1973.* (Japanese)

Despite increased frequency of personal application of pesticides rather than using speed sprayer operations, the frequency of complaints from subjective syptoms in speed sprayer operators increased. During June and July 1973, crops treated personally and using speed sprayers received 45 kinds of pesticides 823 times; this included 298 treatments with organophosphorus pesticides and 143 with Bordeaux mixture. Health examinations showed frequency of abnormal values in the Hb value, RBC, WBC, serum ChE activity, GPT, GOT, alkaline phosphatase activity, LAP, and TTT. Frequency of abnormal values is higher in Nakano area where urbanization is in progress than in three rural villages. Health examinations of speed sprayer operators since 1965 showed that 44% of them had some kind of disease including neuralgia, lumbago, stomach disorders, hypertension, hepatic disease, anemia, and nicotine sulfate poisoning. Operators stressed that improvement of protective clothing is necessary and admitted that carelessness resulted from reduced acute toxicity of newer pesticides.

74-0332. Izumiyama, T.; Nagata, H.; Kamata, K.; Suzuki, H. (Hokushin Gen. Hosp., Nagano Prefect. Welfare Union, Nagano, Japan). **[Consideration on the results of health examination of pesticide applying farmers centering around the examination of liver function.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 188-189; 1973.* (Japanese)

Liver function was examined in 55 speed sprayer operators who mainly spray pesticides in apple orchards in Hokushin. The ChE activity of the operators in Nakano was moderately lower in 1965 and 1966 (minimum Δ pH of 50 $\pm$ 0.12), but recovered to a normal value of Δ pH 0.95 $\pm$ 0.17 in May, 1973, then decreased to Δ pH 0.87 $\pm$ 0.19. Values of sprayers in Kamijo-Hoshina-Kawada areas were stable and stayed normal during 1965-1973. The level of alkaline phosphatase activity of the operators was elevated in both Nakano and Kamijo-Hoshina-Kawada areas (7.7% were over 10 units in the former and 13.3% were over 10 units in the latter) with the normal average value being 5.3. The cause of the difference will be studied during tests of alkaline phosphatase isozymes. The GOT value of the operators in Kamijo-Hoshina-Kawada areas after spraying season, Sept. and Oct., was higher than the normal average value of 14.5 (range of 8.0-23.0) and fluctuated from year to year. Although the fluctuation of the value in Nakano area was small, the level was still higher than normal. Other values such as LDH and GPT were also obtained: LDH was normal, but GPT must be reconsidered because of errors in estimation. Newly determined values of LAP and γ-GTP will be needed for detecting latent disturbances of the liver in speed sprayer operators.

74-0333. Ito, N. (Obihiro Kosei Hospital, Hokkaido, Japan). **[On the investigation of the status of pesticide handling and the importance of educational guidance for farmers handling pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 190-191; 1973.* (Japanese)

The total amount of pesticides used for crop protection in Hokkaido is 6.0-7.0% of the total amount used in Japan. The average amount of application is

more than 10 kg/hectare, with a large range in amount and application times. Usually the farmers do not follow the instructions for application, especially the dose rate, but the number of accidents due to pesticides is decreasing yearly. The existing laws and rules of regulating pesticides do not regulate former pesticides once owned by the farmers. Emptied bottles and bags which had contained the pesticide are not regulated, and instruction for handling these is not given to the farmers. The industrially appointed packagings of pesticides must be burned in special furnaces; however, those on a limited budget cannot afford to construct such a furnace. The Purchasing Federation of Agricultural Cooperative Associations, which sells about 85% of total pesticides in Japan to farmers, should include instructions to educate and guide farmers in handling pesticides in general.

74-0334. Takano, Y. (The Research Group of Pesticide Poisoning, Akita Prefect. Soc. Rural Med., Akita, Japan). **[On the clinical instances of pesticide poisoning in Akita Prefecture during 1971.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 192-193; 1973.* (Japanese)

The number of cases of pesticide intoxication totaled 73, 36 in men and 37 in women. It was the first year when the number of women was larger than that of men, showing increased application by women. Most patients were in their forties (23), followed by those in their fifties (16), and in their thirties (15). Herbicides (16 cases) were most often involved, followed by organophosphorus pesticides. No poisonings due to organochlorine pesticides were found, suggesting the effect of the ban on BHC and DDT since May 1971. Pesticides which frequently caused poisonings were fenitrothion (5 cases), calcium cyanamide (5 cases), 2,4-dichlorophenyl 4-nitrophenylether, diazinon, phenyl mercury acetate, kasugamycin, and blasticidin (each three cases). The number of poisonings resulting from application was 44, other circumstances 20 (less than average), accident 7 (more than average), and attempted suicides 3. No deaths resulted, thanks to early discovery and treatment. Pesticide poisoning occurring in children younger than 9 suggests a need for better storage. Half of the cases occurring during application were topical rather than general with damage to skin. Pesticides which caused dermal damage included herbicides (8 cases), organophosphorus pesticides, and sulfur pesticides (four cases each). The prefectural office says that this indicates less hazardous pesticides; however, when larger amounts have to be applied more often, poisonings will not decrease in number. Moreover, rice grown by using pesticides is said to be more tasty than that grown without pesticides.

74-0335. Fujita, K. (Saku General Hospital, Usuda, Nagano Prefect., Japan). **[Cases of chemical burn of cornea by a herbicide, 1,1′-dimethyl-4,4′-bipyridinium dichloride (paraquat dichloride).]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 194-195; 1973.* (Japanese)

The author describes four cases of severe keratoconjunctivitis caused by accidental contact of paraquat dichloride with external eye parts, which required prolonged treatment. The first case was caused by drops of 24% technical paraquat dichloride splashed into the eyes. After quick rinsing of the eyes, the patient was admitted to the hospital with subjective symptoms of impaired vision (0.6 of normal) and severe pain in the eyes. Clinical findings were ophthalmopalpebral conjunctivitis, severe hyperemia of eyes, marked edema of bulbar conjuctiva, and overall erosion of cornea, with slight redness of skin of the eye lids. Corneal sensation was reduced. No damage was found in the anterior chamber and vitreous body, suggesting the chemical burn did not reach the deeper parts. The keratoconjunctivitis disappeared almost completely after two months, but slight hyperemia remained. The corneal erosion disappeared after one week, and subjective symptoms were improved after two weeks. The second and third cases were caused by contact with a 50-fold diluted solution. The second case was the most serious and recovery most prolonged, probably because of insufficient rinsing and failure to seek medical attention for two days. The fourth case was caused by 24% technical material, but symptoms were slight, probably due to washing the eyes immediately under tap water. In accordance with the manufacturer's recommendations, patients were treated with general and topical application of antibiotics. An ocular ointment for corneal erosion and anesthetic eye drops for severe eye pain are recommended. It is hoped that in at least one's own garden the weeds would be pulled out by hand.

74-0336. Kudo, N. (Kudo Internal Med. Clinic, Aomori, Japan). **[Pathophysiology of pesticide poisoning: Part 15. Current status, clinical aspects, and diagnosis of chronic organophosphorus poisoning.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 196-197; 1973.* (Japanese)

Organophosphorus pesticides were determined in whole blood taken from 132 men and 49 women who did not come in contact with pesticides from Sept. 1972 to the end of March 1973. Blood samples were taken just before pesticide application, and GOT, GPT, LAP, LDH, ALP, serum ChE, erythrocyte ChE, TP, cholesterol, fractions of plasma protein, subjective and objective symptoms, neurological condition, hemolysis, Bidstrup Sign, urinalysis, and blood pressure were examined. Quite surprisingly, methylparathion was detected in 86 cases at levels of 0.006-0.520, salithion in 87 cases at 0.005-0.621, dichlorvos in two cases at 0.043-0.955, and thiometon in 34 cases at 0.005-0.621 ppm in gas chromatograms with FPD. Diagnosis based on the result of examinations resulted in possible chronic organophosphorus poisoning in 14 men and in three women,

although the number of cases did not necessarily correspond to the frequencies of appearance of abnormal values. The frequency of abnormal values of GOT, GPT, LAP, LDH, and ALP was statistically examined. LAP, LDH, and ALP were related to the presence of organophosphorus pesticide in the whole blood.

74-0337. Kanezaki, H.; Sera, T.; Inoue, Y.; Takahashi, T. (The Association for Protecting Health Conditions of Araki Town, Kurume, Japan). **[On the health disturbance of the inhabitants around a pesticide factory in Araki area in Kurume City.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 198-199; 1973.* (Japanese)

A pesticides factory opened in 1960 has formulated organophosphorus, organochlorine, and carbamate pesticides and herbicidal formulations such as PCP and *p*-nitrophenyl 2,4,6-trichlorophenylether. Questionnaires of the Association were given to the inhabitants around the factory and those in two remote areas as controls. The following items were significant: susceptibility to colds, fatigue, sneezing, abdominal aches or heaviness, cough, stiffness in neck, sore throat, thirst, malaise, insomnia, weariness in upper extremities, dryness and stickiness in mouth. Medical examinations carried out on the inhabitants around the factory showed high frequency of redness in pharynx, lowered blood ChE activity, abnormal ECG, abnormal increase of urine erythrocytes, reduced vital capacity and hemoglobin, erratic heart beat, and abdominal pain when pressed. Lowered ChE activity was frequently found in the inhabitants who used well water. According to epidemiological investigation on the cancer deaths, cancer death significantly increased during 10 years among the inhabitants who live within 600 m from the factory. These findings point out that dusts and waste water from the factory cause health problems in the inhibitants near the pesticide factory.

74-0338. Ito, S. (Dept. Ophthalmology, Hiraga General Hospital, Akita Prefect. Welfare Federation of Agr. Co-op Ass. (Koseiren), Hiraga, Japan). **[Chronic external ocular disturbances due to contact with pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 290-291; 1973.* (Japanese)

Since farmers often complain of corneal irritation symptoms such as foreign body sensation, photophobia, and lacrimation after pesticide application, an examination of external ocular parts of 200 pesticide applicators was carried out for four years beginning in 1968. Twenty-three percent of the 200 persons, or 55% of those with abnormal findings showed new formation of corneal vessels without any internal cause, suggesting stimulation by pesticides applied. After observing the degree of conjunctival hyperemia and turbidity and the formation of corneal vessels over the time period, it was concluded that the conjunctiva and corneal symptoms were aggravated during the pesticide application season. Although the symptoms receded somewhat, the improvement in new formation of corneal vessels was poorer than in hyperemia and turbidity, showing persistence of the influence of pesticides over the year. The rate of aggravation in the pesticide application season was 27.8%. Fifty-eight percent of the symptomatic persons had recovered at the time of the pre-application examination. The rate of recovery for new formation of corneal vessels was only 22.2%. This shows that the persons with corneal irritation symptoms again come into contact with pesticides when the symptoms are still present. Serum vitamin B_2 was significantly lower in the patients with newly formed corneal vessels than in normal persons, but the concentration of *p*-nitrophenol in blood, serum ChE activity, and serum transaminanse activity showed no differences. Serum vitamin B_2 in the pesticide applicators was lowest in the pesticide application season.

74-0339. Kambe, Y. (Japan Inst. of Rural Medicine, Usuda, Japan). **[On the investigation of pesticide-allergy by patch test. Part 2.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 292-293; 1973.* (Japanese)

An investigation was carried out on 41 persons in three villages where highland vegetables such as lettuce, cabbage, and Chinese cabbage were mainly grown. Subjects included 19 persons with history of contact dermatitis, eight persons with history of acute intoxication symptoms, and 14 persons without symptoms. The test method consisted of patching vaseline containing 0.1 and 0.01 % of a pesticide on healthy skin for 24 hr. Topical redness under the patch was then examined. The criterion was a diameter of redness over 10 mm. Only pesticides which had been positive in the test group were used for controls. The test results were positive on 68% of persons with history of contact dermatitis, 25% of persons with history of acute intoxication, and on 50% of persons without symptoms, as compared to 30% of controls. Of 46 pesticides tested, those which were positive in more than 50% were dichlorprop (100%), dacthal (56%), maneb (50%), and trifluralin (50%). Twenty-three pesticides, including the above four, were positive in three to 40%.

74-0340. Horiguchi, Y. (Japan Inst. Rural Med., Usuda, Japan). **[Studies on the influence of organophosphorus pesticides on the CNS, Part 2: Effects on the human body.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 294-295; 1973.* (Japanese)

The EEGs of farmers with prolonged pesticide exposure were compared with those obtained in acute nonfatal intoxications by malathion 50% EC swallowed in suicide attempts. The first patient who attempted suicide collapsed suddenly in the street with generalized convulsions and had lapses of consciousness for 15 hours. His EEG showed fine rhythmic alpha waves of 11-12 cps before the suicide attempt; 10 days after the

attempt, diffuse slow (8 cps) alpha waves of moderate amplitude appeared with sporadic slow waves. In the second attempted suicide there was no loss of consciousness despite severe vomiting and pains in abdomen and throat. Serum ChE dropped to zero without any neurological anomaly. The patient's EEG on the day of the intoxication revealed fast waves of low amplitude with a few alpha waves of 12-13 cps. EEGs of pesticide applicators showed occasional slow alpha waves of 8-9 cps before the application period in 50% of orchard applicators and 40% of floriculture applicators. The EEGs remained approximately the same after the application period, except for two instances of slight aggravation of existing occasional slow waves. Acute intoxication by high doses of organophosphates apparently alters the EEG, as does repeated low-dose exposure. Once an altered state has developed, a slight additional exposure results in exacerbation.

74-0341. Cooke, N. J.; Flenley, D. C.; Matthew, H. (Dept. Med., Univ. Edinburgh, Edinburgh, EH3 9YW, Scotland). **Paraquat poisoning. Serial studies of lung function.** *Quart. J. Med., New Ser., 42(168): 683-692; 1973.* (27 references)

Restriction of lung volumes at an early stage, a drop in arterial oxygen tension, and an increase in alveolar to arterial oxygen tension gradient followed by development of an intrapulmonary shunt characterized the progressive lung damage observed in 5 of 6 patients with paraquat poisoning. One patient who probably had not developed "paraquat lung" recovered after treatment for acute renal failure. The changes revealed by serial lung-function studies were not specific to paraquat poisoning, and in diagnosis they must be interpreted with attention to the clinical state of the patient. Lung transplant appears to be the only course of treatment in cases of ingestion of significant amounts of the liquid concentrate. Serial lung-function studies must be undertaken early in order to detect "paraquat lung" in time to search for a suitable donor. Experience with one of the patients on whom a transplant was performed indicated that surgery should not be undertaken until paraquat blood levels are quite low because of the risk of damage to the transplanted lung. Among the six cases described was the first indicence of fatal outcome of ingestion of the granular formulation.

74-0342. Vasilescu, C. (Inst. Neurol. Psychiatry, Acad. Med. Sci., Bucharest, Rumania). **Motor nerve conduction velocity and electromyogram in triorthocresyl-phosphate poisoning.** *Rev. Roum. Neurol. 9(5): 345-350; 1972.* (13 references)

Mean conduction velocities obtained in motor fibers of median, ulnar, and peroneal nerves of 16 patients with tri-*o*-cresyl phosphate poisoning were 73.6, 90 and 63% of normal values. Two different categories of modifications in conduction velocity (c.v.) and electromyographic data were observed. In one, c.v. was as low as 20 m/s and was associated with alterations in EMG activity at rest and in contraction and abolition of deep tendon reflexes, suggesting a lesion of the "axonal degeneration" type. In the other, deep tendon reflexes were hyperactive generally and a muscular hypertonia was often noted. The c.v. values were about 50 m/s, and alterations in the EMG suggested a perikaryon lesion. A patient who had handled dipterex (trichlorfon) and experienced motor disturbances, especially in the lower limbs, as did those with tri-*o*-cresyl phosphate poisoning, exhibited c.v. and EMG values similar to those in the second category.

74-0343. Eskenasy, J. J. (Second CFR Hosp., Neurol. Div., Bucharest, Rumania). **Status epilepticus by dichlorodiphenyltrichlorethane and hexachlorcyclohexane poisoning.** *Rev. Roum. Neurol. 9(6): 435-442; 1972.* (30 references)

A case report of an attempted suicide with lindane and DDT demonstrates the similarity of poisoning by these insecticides in man and other mammals. A convulsive response of the tonic-clonic status epilepticus type occurred within 20 min of ingestion of approximately 27 mg/kg DDT and 18 mg/kg lindane; hepatic involvement and sudorrhea were observed. The patient was immobilized and treated with barbiturates, but these were unsuccessful in controlling convulsions. Clinical remission occurred on the 20th day, and the EEG returned to normal on the 39th day.

74-0344. Muminov, A. I. (Dept. Otorhinolaryngol., Tashkent Inst. Med., Tashkent, USSR). **Funktsional'noye sostoyaniye organa slukha u lits s intoksikatsiyey, vyzvannoy pestitsidami. [Functional condition of the hearing organ in persons with pesticide intoxication.]** *Vestn. Otorinolaringol. 34(6): 33-35; 1972.* (3 references) (Russian)

The auditory function was studied in 25 patients with acute poisoning and another 79 patients with chronic poisoning from organochlorine and organophosphorus pesticides. The patients were 20-50 years old and had been exposed to pesticides occupationally for 1 to 20 years. A high frequency of disturbances of the auditory function and impaired hearing of the type of perceptive deafness were observed in 68 patients. Convex type tonal threshold audiograms were characteristic mainly of patients with exposure times shorter than 10 yrs. Reduced perception of low-frequency tones by patients predominantly with organochlorine pesticide poisoning and reduced perception of high-frequency tones by patients with organophosphorus pesticide poisonings were observed. In cases of methylmercaptophos poisoning, and for exposure times longer than 10 years, the tonal threshold audiograms either were steeply dipping or displayed uniform reduction in the perception of low and middle frequencies and pronounced drop in the

perception of high frequencies. Acute poisonings with aldrin were usually associated with pauses in the perception of the 125, 250, and 8,000 c/s frequencies, and with uniform reduction in the perception of other frequencies. The localization and extent of the pathological process was dependent on the chemical structure of the pesticide, the duration of contact with the same, and the manifestation of the toxic effect of the pesticide.

74-0345. Bennett, D. (Beaumont Anim. Hosp., Roy. Vet. Coll., London NW1, England). **Accidental poisoning in a retriever puppy by a new rodenticide.** *Vet. Rec. 91(24):609-610; 1972.* (5 references)

After consuming about 12 g of a mouse poison, a 10-week-old retriever puppy showed no ill effects for about three hours. He was presented at the hospital the following morning with diarrhea and lethargy. Clinical examination revealed depressed reflexes, normal temperature, strong pulse at 164 per minute, and respiration rate 40 per minute. The manufacturer did not reveal the exact composition of the new rodenticide, but stated that it a contains a sedative and exerts its rodenticidal effect by severe CNS depression. The manufacturer recommended the use of CNS stimulants (methylamphetamine, nikethamide, or ephedrine) as antidotes. The puppy was given methylamphetamine by intramuscular injection at 1 mg/kg body weight every six hours. Recovery was complete by the fourth day. As the use of methylamphetamine is being curtailed, and as the margin of safety with ephedrine is narrow, nikethamide (125 mg for a 6-kg dog, s.c., 3 times per day) may be the preferred antidote.

74-0346. Bennett, D. (Beaumont Anim. Hosp., Roy. Vet. Coll., London, NW1, England). **Poisoning by alphachloralose.** *Vet. Rec. 92(1): 27; 1973.* (2 references)

In a Letter-to-the-Editor, a previous description of poisoning was clarified in response to a letter from Smith and Boyd (see Abstract 73-2874) who had encountered a similar case. Their case was apparently of alphachloralose poisoning which produces CNS depression and hypothermia and is treated only with general supportive therapy after emetics are used. The case in the original letter was due to a new mouse poison, unidentified because of a pending patent, and the symptoms in the dog were CNS depression and gastrointestinal upset. Treatment included general supportive measures and CNS stimulants after emesis was induced.

74-0347. Leyland, A. (Vet. Clin. Pathol. Unit, Dept. Vet. Pathol., Univ. Liverpool, Liverpool, England). **A case of 2,4,5-T poisoning in the dog.** *Vet. Rec. 92(6): 149-150; 1973.* (4 references)

A male dog that had been exercised on a woodland area treated with "Trioxone 100," a mixture of 2,4,5-T esters in diesel oil, vomited several times and died about seven hours after onset of symptoms. Pathological examination two days after death showed severe gastritis with linear hemorrhages on the serosal surface and on the diaphragm. The spleen was engorged and dilated with blood and the liver could not be examined because of the autolysis that had taken place. No known pathogens were found, but stomach contents contained about 2,000 ppm 2,4,5-T, which represents about 3 or 4 times the oral LD50.

74-0348. Phillips, J. M. (21 Chapel Field Rd., Norwich, England). **Endrin poisoning in poultry: a case history.** *Vet. Rec. 92(8): 211-212; 1973.* (2 references)

Poultry fed a diet prepared on the farm from concentrates and home grown cereals died at a high rate after exhibiting a short period of lassitude followed by opisthotonic convulsions. No specific gross lesions, pathogenic bacteria or viruses were found on postmortem examination. The feed was analyzed for all toxicants found on the premises and contained 21 ppm endrin. Analysis of dead birds revealed the presence of 3.9 to 4.9 ppm endrin in carcasses and from 0.7 to 2.5 ppm in tissues. Previous experience has shown that these levels are sufficiently high to cause death. Investigations carried out by the mill supplying the concentrates showed that barley at the farm site was contaminated with endrin at levels which could not have occurred under accepted agricultural practices. The poisonings indicate that extreme care must be taken when toxicants and animal feed are stored in adjacent areas.

74-0349. Hilbery, A. D. R.; Waite, P. R.; MacKinnon, J. (Vet. Hosp., Windsor, Berkshire, England). **Accidental poisoning in animals.** *Vet. Rec. 92(18): 489; 1973.*

In a Letter-to-the-Editor three cases of strychnine poisoning in dogs are presented. Vomiting, followed by collapse, opisthotonus and convulsions, the classical symptoms of strychnine poisoning, were observed with two of the cases. Strychnine was found in stomach and kidney tissue. Both dogs were treated with pentabarbitone sodium, but died about 48 hr after presentation. The third case, which did not have such obvious symptoms, was treated with acepromazine and also died. The possible chain reaction hazard to public health was demonstrated in one of these cases since fur and bones of an ingested animal were found in the stomach. Legislation should be more stringent regarding the use of such poisons.

74-0350. Lloyd, T. S. (Redhorn House, Cleobury Mortimer, Nr. Kidderminster, Worcestershire, England). **Accidental poisoning in birds.** *Vet. Rec. 92(18): 489; 1973.*

About 60% of the free-range poultry which had access to dung from a horse dosed with dichlorvos (Equigard) died despite removal of the contaminated dung in

plastic bags. The fowl had scratched over the dung and picked out the pellets. A Letter-to-the-editor reports that lengthy correspondence with the makers of Equigard has not brought about a satisfactory statement on the hazards to wild and game birds where horses at grass were dosed. However, payment was made to the client, and warnings in regard to fowl are now being printed on each sachet of the pesticide.

74-0351. Wilkinson, G. T. (Small Anim. Cent., Lanwades Park, Kennett, Newmarket, Suffolk, England). **Dieldrin poisoning in the cat.** *Vet. Rec. 92(19): 510; 1973.* (1 reference)

A Letter-to-the-Editor reports the apparent dieldrin poisoning of 10 cats presented to an Ely veterinarian. The animals showed hyperesthesia, apprehension, muscle fasciculations, tetanic spasms, and epileptiform convulsions, with incontinence of the urine and feces. The cats were destroyed on humane grounds, and one cadaver was retained for toxicological examination and analysis of stomach contents, liver, and urine for pesticide residues. No significant amounts of strychnine or organophosphates were found, but a level of 100 ppm dieldrin was observed in the liver along with traces of *p,p'*-DDE and gamma BHC. Several kestrels died of confirmed dieldrin poisoning in the area, suggesting that the birds and cats may have consumed contaminated prey. It is possible that the illegal use of dieldrin-treated seed for the destruction of pigeons, starlings etc. may have been responsible for the poisonings.

74-0352. Rogers, P. A. M.; Spillane, T. A.; Fenlon, M.; Henaghan, T. (Field Investigations Dept., An Foras Taluntais, Dunsinea, Castleknock, Co. Dublin, Ireland). **Suspected paraquat poisoning in pigs and dogs.** *Vet. Rec. 93(2): 44-45; 1973.* (6 references)

An outbreak of fatal illness in pigs and dogs was identified as "suspected paraquat poisoning" on the basis of postmortem findings and the discovery that bags of pig meal had been injected with paraquat. Pigs exhibited clinical signs of vomiting, diarrhea, and respiratory distress; dogs experienced dyspnea, depression, jaundice, normal temperatures, and severe pain in the region of the liver and kidneys. One dog recovered and the other died within 24 hr. Dead animals had no abnormal bacterial growths, and all had gross pulmonary lesions. A positive reaction for paraquat was obtained with samples of meal from bags found neatly punctured and stained brown around the puncture.

74-0353. Ashworth, B. (R & D Div., Rentokil Ltd., Felcourt, East Grinstead, England). **The frequency of animal poisoning by warfarin.** *Vet. Rec. 93(2): 50; 1973.*

The number of animals poisoned by warfarin in the United Kingdom during the period July 1971-72 was estimated as 4,763 from data given by a 14% sample of veterinarians handling small animals. Of these, 80% were dogs, and 8% were cats. About 80% survived when vitamin K treatment and, if necessary, blood transfusions, were administered. Approximately seven animals were poisoned per ton of warfarin used during the period, if the sample is representative of cases handled.

74-0354. Gripper, J. (Glovers Close, Chipping Norton, Oxon, England). **The frequency of animal poisoning by warfarin.** *Vet. Rec. 93(5): 148; 1973.*

In a Letter-to-the-Editor it was suggested that a recently published survey of warfarin poisoning in small animals (see Abstract 74-0353) should have been based on all veterinary practices in Britain, rather than only small animal practices. The survey itself showed that nearly half of the poisoning cases involved animals on a farm. Extrapolation of the number of animals poisoned on a national level would be difficult in any event since many cases are never examined by veterinary surgeons.

74-0355. McParland, P. J.; McCracken, R. M.; O'Hare, M. B.; Raven, A. M. (Min. Agr., Vet. Lab., Coneywarren, Omagh, Co. Tyrone, N. Ireland). **Benzene hexachloride poisoning in cattle.** *Vet. Rec. 93(13): 369-371; 1973.* (2 references)

Cows accidentally given 112 g of a 19.1% lindane powder in their concentrate died within 8 to 80 hours of ingestion. On post mortem examination they had consistently high levels (75 to 177 ppm) of BHC in the perirenal fat. Four pregnant cows given 70 g each of the powder suffered at least one convulsive fit and showed muscular trembling, but recovered without ill effects after treatment with calcium borogluconate and chloral hydrate. As the cows calved, BHC levels in milk were examined and the first was found to be about 20 times the normally occurring level. BHC residues were no higher than normal twelve weeks after the last cow had calved. The suckling calves of the recovered animals were apparently not affected by the pesticide.

74-0356. Udall, N. D. (Tower Hill Rd., Crewkerne, Somerset, England). **The toxicity of the molluscicides metaldehyde and methiocarb to dogs.** *Vet. Rec. 93(15): 420-422; 1973.* (22 references)

A literature review on metaldehyde poisoning in dogs indicates that it is fairly common and that the pellet formulation of slug bait is attractive and palatable to dogs. Symptoms of poisonings are primarily marked depression, vomiting, hyperpnea, tachycardia, incoordination, hyperesthesia, and muscle tremors leading to opisthotonus and continuous convulsions. Treatment is not specific and includes gastric lavage and administration of a universal antidote, and administration of a respiratory stimulant followed by intravenous calcium borogluconate and parenteral isotonic dextrose saline. Poisoning is usually fatal if the agent produces narcosis

beyond medium depth. Hyperemia of liver and kidneys and degeneration of liver cells and ganglion cells in the brain, along with hyperemia and interstitial hemorrhage in the lungs have been observed post mortem. Previously unreported is the finding that acetaldehyde can be detected in the stomach contents. Methiocarb, a more recently introduced molluscicide, is less attractive in its dyed pellet form, but accidental poisoning in dogs has occurred. Specific treatment is available in the form of atropine.

74-0357. Pol'chenko, V. I. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polymers and Plastic Materials, Kiev, USSR). **Klassifikatsiya otravleniy pestitsidami. [Classification of pesticide intoxications.]** *Vrach. Delo 2: 131-134; 1972.* (Russian)

General classification of pesticide poisonings is given on the basis of some 40,000 cases of poisonings known from literature. The aspects of classification include the causes, social nature of poisoning (intentional or accidental), epidemiological signs (direct or indirect), routes of entering the organism (oral, respiratory, or cutaneous), incidence (single, group, or mass poisoning), clinical course of the poisoning (acute, subacute, or chronic), severity, and outcome. The classification is recommended for use in the analysis of pesticide poisonings, for the improvement of diagnosis and recording, and for the elaboration of preventive measures.

74-0358. Marchenko, L. I. (Priluki Hosp., Priluki, USSR). **Bytovoye otravleniye khlorofosom, oslozhnisheyesya polinevritom. [Trichlorfon poisoning, complicated by polyneuritis.]** *Vrach. Delo 4: 116-117; 1973.* (Russian)

A case of polyneuritis-complicated intentional, acute poisoning due to ingestion of 50 ml of trichlorfon is reported. Extreme paleness, unconsciousness, miosis, cyanosis, muscular fibrillation in the face and limbs, hypersalivation, and reduced reflex activity were determined. Therapy with atropine, physiological saline solution, calcium chloride, ascorbic acid, vitamin B1, glucose solution, hydrocortisone, prednisolone, penicillin, and oxygen inhalation was successful. The remaining toxic polyneuritis was treated with vitamins B1, B6, B12, B15, prednisolone, adenosine triphosphate, proserine, and strychnine.

74-0359. Krasnyuk, Ye. P. (Kiev Sci. Res. Inst. Ind. Hyg. Occup. Dis., Kiev, USSR). **Lecheniye khronicheskikh intoksikatsiy, vyzvannykh khlororganicheskimi soyedineniyami. [Therapy of chronic poisonings with organochlorine compounds.]** *Vrach. Delo 4: 142-146; 1973.* (14 references) (Russian)

Therapy of chronic poisonings with organochlorine compounds, such as DDT, BHC, 2-KF, dichloralurea, 2,4-D, polychloropinene, and hexachlorobutadiene, is reviewed. Since the mechanism of action of organochlorine compounds in humans is not known, specific antidote therapy is not available. Glucose, calcium gluconate, and vitamins, especially vitamin B, are useful during the initial stage of the chronic poisoning, characterized by autonomic dystonia and the asthenic syndrome. Belladonna preparations are used for elimination of autonomic irritability and of vascular spasms, and tranquilizers are given to reduce emotional lability. Vitamin preparations, cocarboxylase, adenosine triphosphatase, and oxygen therapy are used to control hypoxia and to increase tonus. Electrophoresis according to Shcherbak with calcium chloride, vitamin B1, dimedrol, or novocaine is also useful. Vitamin B12 is given to control toxic polyneuritis. Hemorrhagic vasculitis is treated with vitamins C and P. B vitamins, thiamine, riboflavin, glucose, and insulin are used for the therapy of toxic hepatitis. Impairments of gastric secretory function are corrected by specific diets, nicotinic acid, and pyridoxine. Vitamins C and B, thiamine, folic acid, and iron preparations are useful in anemia.

74-0360. Kaskevich, L. M.; Bezuglyy, V. P. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Klinika khronicheskikh intoksikatsiy, vyzvannykh TMTD. [Clinical aspects of chronic thiram poisoning.]** *Vrach. Delo 6: 128-130; 1973.* (9 references) (Russian)

Forty-two male and 181 female workers (20-50 years old) occupationally in contact with thiram concentrations substantially exceeding the maximum allowable value for at least three years were examined. Sneezing, coughing, lachrymation, headache, pains in the eyes, vertigo, sometimes epicardial pains, nausea, and fatigue were among the symptoms of the chronic exposure. Changes in the hepatobiliary system (hepatocholecystitis, slight hepatitis of toxic or chemical etiology, disturbed prothrombin and protein synthesis) were most frequent. Myocardial dystrophy, labile arterial pressure, and tendency toward hypertension were observed. Hematological changes in long-time workers manifested themselves in reduced ceruloplasmin activity, moderate hypochromic anemia, and tendency toward leukopenia, neutropenia, and eosinopenia. Vegetative-vascular and astheno-vegetative syndromes were diagnosed. Dystrophic and atrophic changes of the mucosa of the upper respiratory tract were also observed. The combination of thiram with alcohol often caused hyperemia of the face, tachycardia, headache, nausea, emesis, reduced arterial pressure, and sometimes collapse. The administration of vitamins C, P, B6 and B12, glutamic acid, folic acid, and iron preparations is recommended for the therapy of chronic thiram poisonings.

74-0361. Matkovskiy, S. V.; Ishchukova, M. P.; Antochanu, V. A. (Dept. Radiogr. Radiol., Kishinev Med.

Inst., Kishinev, USSR). **Nekotoryye funktsional'nyye izmeneniya pecheni i zhelchevyvodyashchey sistemy u bol'nykh s khronicheskoy intoksikatsiyey pestitsidami. [Functional studies on liver and bile ducts of patients chronically poisoned with pesticides.]** *Zdravookhraneniye 1: 31-34; 1973.* (Russian)

Hepatic and biliary functions were studied in 57 patients chronically poisoned with several pesticides during an occupational contact of 8 to 10 yrs. Toxic hepatitis with hepatomegalia was detected in 49 patients. Bengal rose tests revealed considerable damage of the absorbing and slight damage of the excretory function of the liver in chronic poisoning with combinations of pesticides. Bile function tests revealed hyperkinetic dyskinesia in 34, and hypohypertonic dyskinesia in 16 cases. The respective occurrences of hyperkinetic dyskinesia and of hypohyperkinetic dyskinesia among patients with hepatitis were 30 and 13 cases. The hypohypertonic type of biliary dysfunction represented an advanced phase of the toxic damage of the nervous mechanisms controlling the bile function.

74-0362. Yakubov, A. Ya. (Author address not given). **Klinika i lecheniye intoksikatsiy fosfororganicheskimi i khlororganicheskimi pestitsidami. [Clinical aspects and therapy of organophosphate and organochlorine poisoning.]** *Zdravookhr. Tadzh. 3: 61-64; 1973.* (Russian)

Clinical aspects and therapy of organophosphate and organochlorine pesticide poisonings are outlined in conjunction with two cases of acute occupational poisoning with thiometon and DDT. Acute and subacute organophosphate poisonings, developing in 1 to 36 hr and in 10 to 20 days after the initial contact with pesticides, are characterized by symptoms such as nausea, emesis, epigastric pains, visual disturbances, psychosis, blanched skin, bradycardia, hypotonia, clonic-tonic spasms and muscular fibrillations, tachypnea, miosis. In serious cases, tachycardia, hypertonia, acute cardiovascular insufficiency, coma, pronounced miosis and hypersalivation, pulmonary edema, and possibly death occur. Atropine, 2 PAM and 2 PAS, barbiturates, artificial respiration, and oxygen therapy are administered. Poisonings with organochlorine pesticides cause asthenia, headache, vertigo, palpitation of the heart, anorexia, nausea, emesis, epigastric pains, serious kidney and liver damages, anuria, pains in the chest, paleness, spasms, reduced reflex activity, vision troubles, hepatomegalia, leucocytosis, increased rate of erythrocyte sedimentation reaction, reduced gamma-globulin level, and hypocalcemia. Symptomatic therapy, including gastric lavage, the use of charcoal, barbiturates, luminal, barbamine, C, B1, B2, and B12 vitamins, is used to treat poisonings with organochlorine pesticides.

74-0363. Taeschner, K. L. (Zentrum der Rechtsmedizin, Johann Wolfgang Goethe Universitaet, Frankfurt am Main, Germany). **Veraenderungen am Glomus caroticum des Menschen bei E 605–Vergiftung. [Alterations in the carotid body in humans following E 605 poisoning.]** *Z. Rechtsmed. 73(1): 71-77; 1973.* (19 references) (German)

Morphologic findings in the carotid body after E 605 (parathion) poisoning in 23 fatal cases are reported. Autopsy was performed within 21 to 100 hr after death. Hematoxylin-eosin, PAS, Goldner, and van Gieson-Elastika stains were applied. The ratio of light to dark nuclei in the carotid body was 2.84, whereas the corresponding value established for 13 cases of sudden accidental death was 7.86. The dark nuclei are understood as functional states, the pathogenetic mechanisms of which are discussed. There seems to be evidence that these changes are not agonal in origin. The results do not reveal whether the dark nuclei are due to the direct effect of E 605 on the cells or to the impairment of breathing that is seen clinically in this type of poisoning. The vasodilation observed in the cases of poisoning may be due to the direct action of acetylcholine, or to the action of *p*-nitrophenol, a metabolite of E 605.

See also **74-0267** **74-0269** **74-0288** **74-0295** **74-0304** **74-0420** **74-0424**

74-0364. Unai, T.; Cheng, H. M.; Yamamoto, I.; Casida, J. E. (Dept. Agr. Chem., Tokyo Univ. Agr., Setagaya-ku, Tokyo, Japan). **Chemical and biological *O,O*-demethylation of rotenone derivatives.** *Agr. Biol. Chem. 37(8): 1937-1944; 1973.* (12 references)

3-*O*-Demethyl and 2,3-*O,O*-didemethyl derivatives of natural rotenone (5′β-rotenone), 5′α-rotenone, *d*-epirotenone (5′β-epirotenone), and 5′α-epirotenone are obtained upon reacting 5′β-rotenone or 5′β-epirotenone with two or three molar equivalents of boron tribromide followed by recyclization of the E-ring using sodium bicarbonate. 3-Methoxy-^{14}C-5′β-rotenone is prepared in 16% yield by treating 3-*O*-demethyl-5′β-rotenone with methyl-^{14}C iodide in the presence of alkali followed by epimerization of the ^{14}C-5′β-epirotenone byproduct for increased yield of ^{14}C-5′β-rotenone. 3-*O*-Demethylation is established as a detoxification mechanism for 5′β-rotenone or for one of its metabolites based on the expiration by mice and rats of 27% and 13%, respectively, of the administered radiocarbon as ^{14}carbon dioxide. (Author abstract by permission)

74-0365. Sumida, S.; Hisada, Y.; Kometani, A.; Miyamoto, J. (Res. Dept. Pestic. Div., Sumitomo Chem. Ind. Co., Ltd., Takarazuka, Japan). **Biotransformation of 3-(3′,5′-dichlorophenyl)-5-dimethyloxazolidine-2,4-dione. Part I. Metabolism in the rats.** *Agr. Biol. Chem. 37(9): 2127-2136; 1973.* (10 references)

Using 3-(3′,5′-dichlorophenyl)-5,5-dimethyloxazolidine-2,4-dione (DDOD) labeled with ^{14}C or ^{3}H, absorption, excretion, and tissue distribution in male Wistar rats were studied, and metabolites excreted were identified. At the dosage rates of 100, 300, 1000 and 3000 mg/kg, the maximum excretion of orally administered radioactivity occurred within 24 hr. Increase in the dosage rate was paralleled by decrease in the proportion of urinary elimination. Essentially all the radioactivity was excreted in two weeks. DDOD level was generally low in most tissues. Adipose tissue contained higher radioactivity compared with others. Most of the urinary metabolites identified were characterized by hydroxylation at the 4′ position of the benzene ring moiety, and hydrolytic or oxidative modification of the oxazolidine ring portion.

74-0366. Albert, J. R.; Stearns, S. M. (Vet. Therapeut. Dept., Biol. Sci. Res. Cent., Shell Development Co., P. O. Box 4248, Modesto, CA 95352). **Safety and toxicity of a gel formulation of dichlorvos in the foal.** *Amer. J. Vet. Res. 34(10): 1359-1361; 1973.* (18 references)

Dichlorvos administered in a gel formulation at 20 times the therapeutic dose (400 mg/kg) did not cause the death of any foals, but signs of toxicosis were severe. Although clonic convulsions occurred in all of these animals, they recovered in 1-3 hr. No further signs of intoxication were exhibited although plasma and erythrocyte ChEs were inhibited to the greatest extent on the second day after exposure and recovered slowly. At lower doses signs were less severe and the recovery rapid. Atropine sulfate was highly effective as an antidote and completely prevented clonic convulsions in animals given 400 mg/kg dichlorvos.

74-0367. Bedford, J. W.; Zabik, M. J. (Bur. Water Management, Dept. Natural Resources, Lansing, MI 48914). **Bioactive compounds in the aquatic environment: uptake and loss of DDT and dieldrin by freshwater mussels.** *Arch. Environ. Contam. Toxicol. 1(2): 97-111; 1973.* (14 references)

Maximum amounts of DDT (> 1 ppm) and dieldrin (0.7 ppm) were accumulated by mussels from lake water under continuous flow conditions after one week of exposure to approximately 0.6 ppb. In lake water mussels concentrated DDT approximately 2400 times and dieldrin approximately 1200 times; they concentrated DDT approximately 1000 times in Ca-fortified distilled water. Levels did not reach equilibrium as fast in distilled water as in lake water. The initial half life of dieldrin in lake water was 3.5 days, while a half-life of 13.0 days was found for DDT. Digestive and reproductive tissues concentrated the greatest amounts of pesticide. Small amounts were found in mantle, muscle, and gill tissues.

74-0368. Krieger, R. I.; Lee, P. W. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **Inhibition of in vivo and in vitro epoxidation of aldrin, and potentiation of toxicity of various insecticide chemicals by diquat in two species of fish.** *Arch. Environ. Contam. Toxicol. 1(2): 112-121; 1973.* (22 references)

Tissue homogenates of goldfish and mosquitofish had an active aldrin epoxidase system which was sensitive to inhibition by diquat. The I50 for diquat in goldfish liver was $8.0 \times 10^{-6} M$. During experiments with mosquitofish in vivo dieldrin accounted for 22.8% of the total aldrin plus dieldrin (the only electron-capturing compounds observed) when diquat was not present in the medium and for 4.5% when diquat was present at 8×10^{-3}. Significant reductions in aldrin metabolism were not observed at lower diquat concentrations which might occur under normal conditions. Overt symptoms of intoxication by diquat were not observed at the levels under investigation. The toxicities of DDT, aldrin, and parathion, at approximately 1/2 LD50, were not affected by diquat at 275 ppm; onset of symptoms was shortened and 24-hr mortality increased in the case of carbaryl.

74-0369. Vinopal, J. H.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Metabolic stability of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in mammalian liver microsomal systems and in living mice.** *Arch. Environ. Contam. Toxicol. 1(2): 122-132; 1973.* (10 references)

Dibenzo-*p*-dioxin was extensively converted to more polar products by liver microsomal preparations from rat, rabbit, and mouse in the presence of NADPH, but no conversion was observed without NADPH. In contrast, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin was not metabolized by either system. In mice given labeled dibenzo-*p*-dioxin, 26% of the administered radioactivity was found in the urine, mostly as water soluble material, and 4.7% in the feces after three days. With labeled tetrachlorodibenzo-*p*-dioxin, however, 13% appeared in the feces and 32% in the liver, and the material was organosoluble and cochromatographed with tetrachlorodibenzo-*p*-dioxin. The material extracted from the liver was apparently localized in the endoplasmic reticulum.

74-0370. Holmstead, R. L.; Fukuto, T. R.; March, R. B. (Dept. Entomol., Div. Toxicol. Physiol., Univ. California, Riverside, CA 92505). **The metabolism of *O*-(4-bromo-2,5-dichlorophenyl)*O*-methyl phenylphosphonothioate (leptophos) in white mice and on cotton plants.** *Arch. Environ. Contam. Toxicol. 1(2): 133-147; 1973.* (12 references)

Most of the leptophos administered orally to mice was excreted within 48 hr as degradation products in the urine. A conjugate of 4-bromo-2,5-dichlorophenol accounted for 89% of the radioactivity, and other products included free 4-bromo-2,5-dichlorophenol, *O*-methyl phenylphosphonothioic acid, methyl phenylphosphonic acid, and phenylphosphonic acid. Small amounts of leptophos and its oxon were recovered in the feces. Mice given leptophos (25 mg/kg) developed muscular spasms and convulsions within 15 min, but after 5-8 hours all toxic symptoms disappeared. The products recovered from cotton plants to which leptophos had been applied were similar to those found in mice, but most of the material was unchanged leptophos. The results suggest that leptophos could be used as a long-term residual insecticide without being concentrated in the food chain.

74-0371. Bull, D. L.; Borkovec, A. B. (Cotton Insects Res. Lab., Agr. Res. Serv., U.S.D.A., Cotton Station, TX 77840). **Metabolism of carbon-14-labeled HEMPA by adult boll weevils.** *Arch. Environ. Contam. Toxicol. 1(2): 148-158; 1973.* (16 references)

^{14}C-HEMPA, fed to adult boll weevils alone or in combination with busulfan for six days, was rapidly converted to at least nine products, including *N,N',N''*-trimethylphosphoric triamide, *N,N,N',N''*-tetramethylphosphoric triamide, and pentamethylphosphoric triamide, and excreted. Most of the radioactivity was eliminated from the body within 24 hr after removal of fortified diet. A total of 0.375 μCi of radiocarbon was recovered as expired CO_2 after a 128-hr feeding period, and only 0.003 μCi remained in the body 72 hr after fortified diet was removed. Only 0.6 μg of material in the insect after 6 days exposure was HEMPA. Since the compound has a low toxicity and mutagenicity in mammals, a release of 100 weevils sterilized by this treatment per acre would produce only negligible potential contamination. This could be reduced by holding the weevils for 24 hr before release.

74-0372. Khan, M. A. Q.; Stanton, R. H.; Sutherland, D. J.; Rosen, J. D.; Maitra, N. (Dept. Biol. Sci., Univ. Illinois at Chicago Circle, Chicago, IL 60680). **Toxicity-metabolism relationship of the photoisomers of certain chlorinated cyclodiene insecticide chemicals.** *Arch. Environ. Contam. Toxicol. 1(2): 159-169; 1973.* (13 references)

Photodecomposition products of aldrin, dieldrin, and heptachlor were more toxic than the parent compounds to adult houseflies and to freshwater invertebrates and vertebrates. Photoisodrin and photochlordene, however, were less toxic than isodrin and chlordene in the same tests. Photodieldrin was 12 and 5 times more toxic than dieldrin to *Gammarus* and bluegill fry, respectively, and photoaldrin was 6 and 4 times more toxic than aldrin to mosquito larvae and bluegill fry, respectively. The antioxidant synergist, sesamex, lowered the toxicity of photodieldrin, photoaldrin, and photoheptachlor, but synergized the toxicity of photodieldrin ketone, photoisodrin, and photochlordene. The synergistic effect was probably related to the inhibition of hydroxylation of these compounds. Toxicity-metabolism studies indicated that photodieldrin ketone was responsible for the increased toxicity observed with the photolysis products of aldrin and dieldrin. A possible explanation for the differences in toxicity of the photoisomers other than photodieldrin ketone was proposed. The acidic proton on the secondary chloride in photoaldrin, photodieldrin, and photoheptachlor may induce the formation of charge-transfer complexes between nerve components and the mixed-function oxidase which dehydrochlorinates the products to their ketones. Since these ketones are lipophilic, their accumulation in the food chain should be studied.

74-0373. Nelson, J. O.; Matsumura, F. (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706). **Dieldrin (HEOD) metabolism in cockroaches and house flies.** *Arch. Environ. Contam. Toxicol. 1(3): 224-244; 1973.* (30 references)

At least seven metabolites were isolated from American cockroaches treated with ^{14}C-dieldrin and held for 10 days. The major metabolite was identified as *cis*-aldrindiol, a compound which has not been previously reported to be a metabolite of dieldrin. The presence of other metabolites indicated that oxidative as well as hydrolytic systems were active in the cockroach. The monohydroxy derivative of dieldrin with the hydroxyl moiety in a tertiary position was found in a number of tissues. In the German cockroach, the same

metabolites were recovered, but the relative amounts were different from those of the American cockroach. Neither the monohydroxy derivative nor the *cis*-aldrindiol were found in treated houseflies, and metabolism in this insect was low and parallel to that observed in the rat. Metabolism of dieldrin in vitro by fat body preparations supported the data obtained in vivo from the American cockroach.

74-0374. Mehendale, H. M.; Chen, P. R.; Fishbein, L.; Matthews, H. B. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Effect of mirex on the activities of various rat hepatic mixed-function oxidases.** *Arch. Environ. Contam. Toxicol. 1(3): 245-254; 1973.* (20 references)

Exposure of rats to five daily doses of from 5 to 50 mg/kg mirex resulted in enlarged liver, reduced body weight, serious alterations in the mixed-function oxidase systems, and death of several animals. A 50% reduction in aniline hydroxylase activity was observed in preparations from animals treated at the 25 mg/kg dose, although levels of this compound present in the microsomes did not affect activity of the enzyme when studied in vitro. An inverse relationship was observed with mirex treatment and hepatic *O*-demethylation. In female rats the activity always exceeded that of controls. At the 25 mg/kg level mirex stimulated the activity of total UDP-glucuronyltransferase in the liver by 173% in males and 149% in females.

74-0375. De La Cruz, A. A.; Naqvi, S. M. (Dept. Zool., Mississippi State Univ., MS 39762). **Mirex incorporation in the environment: uptake in aquatic organisms and effects on the rates of photosynthesis and respiration.** *Arch. Environ. Contam. Toxicol. 1(3): 255-264; 1973.* (9 references)

Uptake of mirex by several aquatic invertebrates varied with concentration and species of animal. Exposure to 2 ppm for 48 hr resulted in an uptake of 10.0 to 11.0 ppm in crustaceans and 1.9 to 5.1 ppm in leeches. The leeches survived indefinitely at this concentration, but within 168 hr all the crustaceans and dragonfly naiads had died. Photosynthesis in a natural sample of plankton was reduced by 16, 10, 33, and 19% after 5, 10, 15, and 20 days' exposure to 1 ppb mirex, while a pure culture of the phytoplankton, *Chlamydomonas* sp., showed a 55% inhibition of photosynthesis after 168 hr exposure at this concentration. At elevated concentration or extended exposure at low concentration respiration rates of plankton decreased by as much as 50%.

74-0376. Clark, A. G.; Smith, J. N.; Speir, T. W. (Biochem. Dept., Victoria Univ. Wellington, Wellington, New Zealand). **Cross specificity in some vertebrate and insect glutathione-transferases with methyl parathion (dimethyl *p*-nitrophenyl phosphorothionate), 1-chloro-2,4-dinitrobenzene and *S*-crotonyl-*N*-acetylcysteamine as substrates.** *Biochem. J. 135(3): 385-392; 1973.* (23 references)

Enzymes catalyzing the reaction between GSH and methylparathion (dimethyl *p*-nitrophenyl phosphorothionate), 1-chloro-2,4-dinitrobenzene and *S*-crotonyl-*N*-acetylcysteamine were separated by $(NH_4)_2SO_4$ precipitation from homogenates of sheep, rat and mouse livers and from homogenates of cockroaches, houseflies, and grass grubs. Electro-focusing of the preparations from each of these species separated a number of zones, each of which catalyzed the reaction of GSH with all three substrates. Ion-exchange chromatography on CM-cellulose also separated a number of fractions in which activity towards the three substrates coincided. In both separation methods patterns of the activities were consistent with the presence in all species of several GSH transferases each having a degree of cross specificity towards the three substrates. (Author abstract by permission)

74-0377. Lenz, D. E.; Deguehery, L. E.; Holton, J. S. (Basic Med. Sci. Dept., Med. Res. Lab., Edgewood Arsenal, MD 21010). **On the nature of the serum enzyme catalyzing paraoxon hydrolysis.** *Biochim. Biophys. Acta 321: 189-196; 1973.* (19 references)

A modified spectrophotometric method for analyzing the enzymatic activity of the serum enzyme which catalyzes the hydrolysis of paraoxon (E-600) has been developed. It was found that the reaction is not subject to either substrate or product inhibition. Neither *p*-aminophenyldiethyl phosphate nor *p*-aminophenylpinacolyl methylphosphonate were substrates, but were competitive inhibitors with *Ki* values of $1.02 \times 10^{-3} M$ and $4.4 \times 10^{-4} M$ respectively. The enzyme active site is proposed to contain a hydrophobic region at the binding site and to require an electron withdrawing group in the substrate to ensure that cleavage occurs through the P–O bond or to stabilize an anionic site at the active site. (Author abstract by permission)

74-0378. Staiff, D. C.; Irle, G. K.; Felsenstein, W. C. (Wenatchee Res. Station, Perrine Primate Lab., Office of Res. Monitoring, Environ. Protect. Agency, Wenatchee, WA). **Screening of various adsorbents for protection against paraquat poisoning.** *Bull. Environ. Contam. Toxicol. 10(4): 193-199; 1973.* (19 references)

Amberlite CG-120, either 100-200 or 200-400 mesh, was the most effective of 26 adsorbents tested in removing paraquat from artificial gastric fluid. Over 99% of the material was adsorbed using the resin, while only 59.7% was removed by the next most efficient adsorbent. Limited exploratory work in animals has shown that the Amberlite resins can reduce tissue levels compared with non-treated animals and, in some cases, protect against poisoning.

74-0379. Dorough, H. W.; Hemken, R. W. (Univ. Kentucky, Lexington, KY 40506). **Chlordane residues in milk and fat of cows fed HCS 3260 (high purity chlordane) in the diet.** *Bull. Environ. Contam. Toxicol. 10(4): 208-216; 1973.* (8 references)

Oxychlordane, α-chlordane, and γ-chlordane were detected in the milk fat of cows fed a diet containing 1, 10, or 100 ppm of HCS-3260 (74% α-chlordane and 24% γ-chlordane). Residues leveled off at about 0.5 ppm after 10 days of feeding of the 1 ppm dose and at 5.0 ppm after 45 days of feeding the highest dose. Within seven days after removal of the treated feed, levels dropped about 50%, and a slow decline was observed from the 7th to the 14th day. From 70 to 75% of the total residue in milk fat obtained during treatment was oxychlordane, and its concentration increased with time even after a plateau in total residue was achieved. A similar pattern of oxychlordane disposition was observed in body fat.

74-0380. Jakubowski, T.; Crowder, L. A. (Dept. Entomol., Univ. Arizona, Tucson, AZ 85721). **Binding of ^{36}Cl-dieldrin to suspected target and non-target proteins in vitro.** *Bull. Environ. Contam. Toxicol. 10(4): 217-224; 1973.* (13 references)

The nature of dieldrin binding was investigated using dialysis of albumin-globulin, Fraction V serum protein, and neural homogenates from rat spinal cord and cockroach ventral nerve. Separate and distinct regression lines were obtained for the binding of dieldrin to albumin-globulin and Fraction V, but the amounts of dieldrin bound per mg of protein were similar (0.534 and 0.511 *nM*). A 3.3-fold increase (9.41 *nM* per mg of protein) in binding was observed with rat spinal cord homogenate, and the single point obtained with cockroach neural homogenate indicated a similar degree of binding. After TCA precipitation of albumin-globulin or Fraction V protein preparations, very little dieldrin was found in the supernatant, suggesting that protein binding alone occurred. Treatment with organic solvents revealed that the bonds formed were probably not covalent.

74-0381. Kimbrough, R. D.; Gaines, T. B. (Environ. Protect. Agency, Chamblee Toxicol. Lab., 4770 Buford Highway, Chamblee, GA 30341). **The chronic toxicity of hexamethylphosphoramide in rats.** *Bull. Environ. Contam. Toxicol. 10(4): 225-226; 1973.* (7 references)

The incidence of lung disease was the only parameter studied during chronic toxicity tests of HEMPA (hexamethylphosphoramide) in rats which was generally higher in treated animals than in controls. Lungs were considered diseased when microscopic examination showed evidence of bronchitis, peri-bronchitis, bronchiectases, bronchopneumonia, abscess formation, or fibrosis. With doses of 0.78 to 6.25 mg/kg/day incorporated in the food for two years, mortality, tumor incidence, chronic kidney disease, and testicular atrophy varied, but were not consistently higher in treated animals than in controls. Reproduction was not affected by administration of 6.25 mg/kg/day.

74-0382. Ross, J. A.; Tweedy, B. G. (Dept. Plant Pathol., Univ. Missouri, Columbia, MO). **Malonic acid conjugation by soil microorganisms of a pesticide-derived aniline moiety.** *Bull. Environ. Contam. Toxicol. 10(4): 234-236; 1973.* (7 references)

A new metabolite of chlordimeform, 4′-chloro-2′-methylmalonanilic acid, was isolated after dark incubation of labeled pesticide for three weeks with soil in synthetic medium. The compound accounted for an average of 22% of the total added radioactivity, while only the hydrolysis product (50% of the total added radioactivity) was recovered from incubation mixtures with sterile soil. TLC and MS were used to identify the metabolite, and confirmation was obtained by synthesizing authentic 4′-chloro-2′-methylmalonanilic acid and its methyl ester and comparing chromatograms and mass spectra. Such conjugation of the aniline moieties of pesticides with malonic acid has previously only been reported for plants.

74-0383. Savateyev, N. V.; Tonkopiy, V. D.; Brestkina, L. M.; Gromov, A. Ye. (S. N. Kirov Milit. Med. Acad., Leningrad, USSR). **Analysis of the mechanism of the therapeutic action of hyperbaric oxygen in poisoning by organophosphorus compounds.** *Bull. Exp. Biol. Med. 75(3): 274-276; 1973.* (11 references)

English translation; for an abstract of the original Russian article, *Byull. Eksp. Biol. Med.* 75(3): 51-53; 1973, see Abstract no. 74-0111.

74-0384. Black, W. D.; Wade, A. E.; Talbot, R. B. (Sch. Pharm., Univ. Georgia, Athens, GA). **A study of the effect of ovex on parathion toxicity in rats.** *Can. J. Physiol. Pharmacol. 51(9): 682-685; 1973.* (15 references)

Oral administration (100 mg/kg) of the miticide ovex (*p*-chlorophenyl *p*-chlorobenzene-sulfonate) caused a decrease in the hexobarbital sleeping time of rats. Administration of this same dosage of ovex resulted in a significant decrease in the toxicity of orally administered parathion (100 mg/kg) to rats. The changes in rats noted in conjunction with the increased resistance to organophosphate toxicity in vivo were an increased liver size, an increased rate of in vitro α-naphthyl acetate hydrolysis by the 9000 × *g* liver supernatant. The hexane-extractable organophosphate detected in the liver of the ovex-pretreated rats was significantly lower than the hexane-extractable organophosphate found in the liver of the control rats. (Author abstract by permission)

74-0385. Silberstein, G. B. (Univ. of Minnesota, Minneapolis, MN). **A study of the effects of the herbicide**

2,4,5-trichlorophenoxyacetic acid on the protozoan *Tetrahymena pyriformis* strain ST. *Diss. Abstr. Int. 34(5): 1889B-1890B; 1973.*

Exponential growth and respiration of *Tetrahymena pyriformis* ST was inhibited by 2,4,5-T at concentrations of 4×10^{-4} *M* and above; cells treated with concentrations below 9×10^{-4} *M* recovered from inhibition about 50 minutes after treatment. Cells which had recovered from 5×10^{-4} *M* 2,4,5-T were approximately 40% larger than the controls, but protein per cell did not differ from the controls. No differences between treated and untreated cells were observed under the electron or light microscope. Whole cell oxygen consumption was inhibited by 35% in less than 15 seconds by 7×10^{-4} *M* 2,4,5-T. Maximum inhibition, 50%, was reached in 30 minutes, and oxygen consumption returned to normal after one hour. Three modes of action were detected. At concentrations less than 10^{-3} *M*, 2,4,5-T was a noncompetitive inhibitor of succinic dehydrogenase, while at greater concentrations it was a competitive inhibitor of this enzyme activity. Spectral data from isolated mitochondria and purified equine cytochrome *c* demonstrated that 10^{-3} *M* 2,4,5-T facilitates the reoxidation of dithionite reduced cytochromes and flavoprotein. This effect presumably occurred in mitochondria simultaneously with inhibition of SDH. Analyses of medium in which *Tetrahymena* had recovered from treatment with 2,4,5-T revealed that little or none of the chemical was degraded or sequestered. Mitochondria from recovered cells were more dense than those from controls. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-25,698.)

74-0386. Chambers, J. E. (Mississippi State Univ., State College, MS). **Studies of organophosphorus insecticide toxicity and possible mechanisms of tolerance in insecticide-susceptible and -resistant populations of mosquitofish (*Gambusia affinis*).** *Diss. Abstr. Int. 34(5): 2259B; 1973.*

Mosquitofish can tolerate about 40 times more methyl parathion than parathion; the difference is due partially to the 7 times more rapid degradation of methyl paraoxon than paraoxon, and partially to the 6-10 fold lower sensitivity of acetylcholinesterase and carboxylesterases to methyl paraoxon than to paraoxon. The resistant population is 1.3 times more tolerant to methyl parathion and 1.5 times more tolerant to parathion than the susceptible population. Resistant fish have 1.3 fold higher levels of acetylcholinesterase, 1.6 fold higher levels of carboxylesterases, and 1.3 fold higher levels of microsomal mixed function oxidases than susceptible fish; the latter enzymes can degrade methyl parathion. Resistance to methyl parathion and induced tolerance to parathion are not caused by altered acetylcholinesterase sensitivity to phosphorylation or degradation of the phosphates by phosphotriesterases. The carboxylesterases of resistant fish may be more sensitive to phosphate inhibition than those of susceptible fish. Carboxylesterases are 13-42 fold more sensitive to phosphate inhibition than is acetylcholinesterase. Carboxylesterases probably serve two functions in organophosphorus insecticide tolerance: slow degradation of phosphates and acetylcholinesterase protection because of their higher affinity for the phosphates. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-25,726.)

74-0387. Osweiler, G. D. (Iowa State Univ., Ames, IA). **The influence of an orally administered antibiotic combination on the [illegible]icity of warfarin to swine.** *Diss. Abstr. Int. 34([illegible]B; 1973.*

Recent [illegible]s of a hemorrhagic syndrome in swine suggest[illegible] vitamin-K-responsive hypoprothrombinemia. Toxicosis was induced in weanling swine fed warfarin daily at 0.025 mg/lb body weight. Approximately five days were required for clinical poisoning to occur at that level of warfarin. Characteristic clinical signs are lameness, anorexia, subcutaneous hematomas, melena, and periarticular enlargement. Administration of warfarin at 0.005 and 0.0075 mg/lb did not cause clinical toxicosis, while 0.0125 mg/lb produced significant increases in one-stage prothrombin time and activated partial thromboplastin time. A tylosin-sulfamethazine antibacterial combination fed alone did not change a variety of blood factors, but exerted a significant protective effect on pigs fed warfarin at 0.025 mg/lb. Of two pigs given warfarin at 1.25 mg/lb body weight, the pig treated daily with parenteral sulfamethazine had lower plasma warfarin levels and returned more quickly toward normal than did the animal receiving only warfarin. Sulfamethazine appeared to stimulate increased drug metabolism or excretion. These studies largely dispel the theory that antibiotics are detrimental to the vitamin K or prothrombin complex status of swine. On the contrary, the antibiotics tested seem to exert a protective effect. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-25,249.)

74-0388. Thompson, O. A. C. (Auburn Univ., Auburn, AL). **Effects of six *s*-triazine herbicides on energy relations of isolated mitochondria and chloroplasts.** *Diss. Abstr. Int. 34(5): 2271B; 1973.*

Earlier investigations showed that prometryne inhibited state 3 respiration of both corn shoot and rat liver mitochondria. The effects on mitochondria of five other structurally related herbicides (ametryne, simetryne, atratone, prometone, and simetone) were investigated. All triazines studied inhibited state 3 respiration in mitochondria isolated from etiolated bean hypocotyl and rat liver. The source of mitochondria did not affect the degree of inhibition. Prometryne inhibited state 3 respiration to a greater degree than did any of the other herbicides tested. The degree of ametryne inhibition was

slightly lower than that of prometryne inhibition. Prometone, atratone, and simetryne inhibited state 3 less effectively than prometryne or ametryne. Prometryne, ametryne, and simetone inhibited cyclic photophosphorylation of isolated pea chloroplasts. Prometryne showed the greatest degree of inhibition. Atrazine had no effect on cyclic photophosphorylation. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-26,121.)

74-0389. Sram, R. J.; Zudova, Z. (Inst. Hyg. Epidemiol., Prague 10, Czechoslovakia). **Effect of the dose-fractionation on the frequency of chromosome aberrations induced in mice by TEPA.** *Folia Biol. (Prague) 19: 58-67; 1973* (14 references)

A single administration of 1 mg of TEPA in mice induced the characteristic biphasic increase in dominant lethals, particularly in the postmeiotic stage of spermatogenesis, and a normal frequency of fertilization was observed. When the dose was fractionated into 2, 5 or 10 equal parts and administered at various time intervals, the frequency of dominant lethals and fertilization in the postmeiotic stage was decreased. The spectrum of genetic injury changed depending on the scheme of fractionation. The decrease in frequency of dominant lethals might have been due to elimination of germ cells that were sensitive to induction of mutations and cell killing.

74-0390. Elespuru, R. K.; Lijinsky, W. (Oak Ridge Grad. Sch. Biomed. Sci., Univ. Tennessee, Oak Ridge, TN 37830). **The formation of carcinogenic nitroso compounds from nitrite and some types of agricultural chemicals.** *Food Cosmet. Toxicol. 11(5): 807-817; 1973.* (7 references)

Many widely used agricultural chemicals are derivatives of alkylureas and alkylcarbamic acids. All compounds of these types react with nitrite in mildly acid conditions to form a dialkylnitrosamine or an *N*-nitroso derivative, or both. The interaction of trisubstituted ureas with nitrite in mildly acid solution can lead to two products, the appropriate nitrosourea and, by nitrosative cleavage, the dialkylnitrosamine. Except with *N*-phenyldialkylureas, the nitrosourea is the major product. Phenyldialkylureas and trisubstituted thioureas give dialkylnitrosamine as the sole *N*-nitroso product. Tetraalkylureas and bis-(dialkylthiocarbamyl)-disulfides also form dialkylnitrosamines by reaction with nitrous acid. The yields of these carcinogenic nitrosamines are significant at 37°C and at low concentrations of the tertiary amine (0.01 M). The insecticide, carbaryl, reacts with nitrous acid to form a highly mutagenic *N*-nitroso derivative. (Author abstract by permission)

74-0391. Schwartz, C. C.; Nagy, J. G.; Streeter, C. L. (Colorado State Univ., Fort Collins, CO 80521). **Pesticide effect on rumen microbial function.** *J. Anim. Sci. 37(3): 821-826; 1973.* (12 references)

In vitro digestion of dry matter (ground alfalfa hay) in goat rumen fluid was not significantly altered by 100 ppm or less of Bordeaux mixture, toxaphene, Mema RM, DDT, EPN, malathion-EPN, Zectran, 2,4-D-DDT, dieldrin, parathion, Mobam, aldrin, malathion-carbaryl, carbaryl, malathion, 2,4-D, Baygon, or Black Leaf 40. At concentrations of 1000 ppm, Bordeaux mixture, toxaphene, Mema RM, DDT, EPN, Zectran, dieldrin, parathion, Mobam, and aldrin significantly reduced in vitro dry matter and cell wall constituent digestion, while no effect was observed with the other pesticides tested. When Bordeaux mixture and 2,4-D were fed to goats for 12 days at levels near 300 ppm, cell wall constituent and dry matter digestion in vivo was not impaired. Since pesticide residues on forage are usually low, they would probably have a negligible effect. Levels necessary for inhibition would in most cases exceed the LD50 for the compound.

74-0392. Walker, W. W.; Stojanovic, B. J. (Gulf Coast Res. Lab., Ocean Springs, MS.) **Acetylcholinesterase toxicity of malathion and its metabolites.** *J. Environ. Qual. 2(4): 474-475; 1973.* (7 references)

Malathion, under in vitro laboratory conditions, is readily degraded by an *Arthrobacter* species to four metabolites–malathion half-ester, malathion dicarboxylic acid, potassium dimethyl phosphorothioate, and potassium dimethyl phosphorodithioate. However, it is not clear whether or not this degradation represents a simultaneous detoxication of the malathion molecule. With this in mind, the relative toxicity of each of the four metabolites to bovine acetylcholinesterase was determined manometrically with the Warburg apparatus. Malathion half-ester retained roughly one-third the enzyme toxicity of unaltered malathion, while the other metabolites showed essentially no enzyme inhibition. It was concluded that while microbial conversion of malathion to malathion half-ester may well represent complete malathion degradation, it does not constitute complete insecticide detoxication. (Author abstract by permission)

74-0393. Ito, N.; Nagasaki, H.; Arai, M.; Sugihara, S.; Makiura, S. (Cancer Cent. Inst., Nara Med. Univ., Kashihara, Nara 634, Japan). **Histological and ultrastructural studies on the hepatocarcinogenicity of benzene hexachloride in mice.** *J. Nat. Cancer Inst. 51(3): 817-826; 1973.* (43 references)

Mice fed 500 or 250 ppm of α-BHC alone and in combination with other isomers for 24 wk developed nodular hyperplasia and hepatocellular carcinoma. At 100 ppm, α-BHC did not induce tumors, and the other isomers were inactive at all three doses. Ultrastructural studies showed a marked increase in smooth endoplasmic reticulum in the cytoplasm of cells in the areas of hepatocellular carcinoma and a decrease in the rough endoplasmic reticulum. Nuclear changes were frequently

observed, and the cytoplasm contained many concentrated lamellar bodies. Increases in smooth endoplasmic reticulum were also seen in non-neoplastic areas in animals treated with the α-isomer.

74-0394. Turusov, V. S.; Day, N. E.; Tomatis, L.; Gati, E.; Charles, R. T. (International Agency Res. Cancer, 69008 Lyon, France). **Tumors in CF-1 mice exposed for six consecutive generations to DDT.** *J. Nat. Cancer Inst. 51(3): 983-997; 1973.* (12 references)

Six consecutive generations of minimal inbred CF-1 mice were fed technical DDT at levels of 2, 10, 50, and 250 ppm in the diet for their entire lifespans. The incidence of hepatomas in males was increased 50 to 55.9% at the 2, 10, and 50 ppm doses and 86% at the 250 ppm level. In females, significant increases (13% and 65.5%) in hepatoma incidence were observed only with the 50 and 250 ppm dose. The average lifespan of hepatoma-bearing animals was lower than that of controls at all levels in males and at the highest level in females. An apparent, but not significant, increase in the incidence of lung tumors was noted at the levels of 2 and 10 ppm DDT. F_1 and F_5 generations had a generally lower incidence of tumors in all treatment groups than the other generations. A significant increase in the occurrence of malignant liver tumors occurred at the 250 ppm level, and 10 of the 56 tumors of this type metastasized to the lungs.

74-0395. Boehm, G. M. (Dept. Morphol., Med. School Ribeirao Preto, Univ. Sao Paulo, Brazil). **Changes in lung arterioles in pulmonary oedema induced in rats by alpha-naphthyl-thiourea.** *J. Pathol. 110(4): 343-345; 1973.* (13 references)

Increased permeability occurred in lung arterioles as well as in capillaries and venules in pulmonary edema induced by ANTU (alpha-naphthylthiourea). Rats given ANTU at a dose of 10 mg/kg intraperitoneally were injected 3 hr 15 min to 4 hrs 30 min later with colloidal carbon. After 30 min the animals were sacrificed; a barium-gelatin mixture was injected into the pulmonary artery, and the great vessels of the base of the heart were ligated. The mixture did not pass through the capillary bed, allowing arterioles to be identified. Both vessels containing the mixture and those believed to be venules exhibited changes in permeability through carbon accumulation.

74-0396. Ellory, J. C.; Nibelle, J.; Smith, M. W. (A.R.C. Inst. Anim. Physiol., Babraham, Cambridge CB2 4AT, England). **The effect of salt adaptation on the permeability and cation selectivity of the goldfish intestinal epithelium.** *J. Physiol. (London) 231: 105-115; 1973.* (18 references)

The mean rates of alkali metal cation uptake into goldfish intestinal tissue from both fresh and salt water-adapted fish were investigated using inulin to determine the contribution of extracellular space. Thallium was taken up at a faster rate than potassium, rubidium, cesium, sodium, or lithium. Only sodium showed a significant decrease in uptake after adaptation to salt.

74-0397. Zakirov, U. B.; Volokhvyanskiy, Ye. A.; Kadyrov, U. Z. (Dept. Pharmacol., Tashkent Inst. Med., Tashkent, USSR). **Vliyaniye malykh doz butifosa na aktivnost' fermentov tonkogo kishechnika pri dlitel'nom vvedenii. [Effect of prolonged exposure to small quantities of butiphos on the activity of enzymes of the small intestine.]** *Med. Zh. Uzb. 4: 16-19; 1973.* (Russian)

Daily doses of butiphos (DEF) equaling 1/50 of LD50 (205 mg/kg) were administered to rats for 15 to 120 days. The monoglyceride lipase activities, determined in the mucosa of the small intestine on the 15th, 30th, 60th, and 120th days of poisonings, were 4.08±0.40, 5.36±0.24, 1.66±0.42, and 4.22±0.39 μmol/g/min, as compared to the respective control values of 5.72±0.50, 3.66±0.36, 3.95±0.14, and 9.27±0.18 μmol/g/min. The invertase activities determined in test animals on the same dates were 7.99±1.31, 11.32±0.52, 8.51±1.01, and 12.12±0.78 μmol/g/min against the corresponding control values of 10.27±1.45, 11.78±0.56, 7.92±1.15, and 8.11±1.21 μmol/g/min. The test and control values obtained for the alkaline phosphatase activity were 1.79±0.13, 1.70±0.08, 3.50±0.16, and 5.40±0.30 μmol/g/min, and 2.02±0.35, 1.34±0.16, 2.61±0.35, and 3.50±0.22 μmol/g/min. The glycylvaline dipeptidase activity did not change significantly during the test period. The serum cholinesterase activity of the test animals decreased by 230 to 300% by the 60th and 120th days of the experiment. The weight of the small intestinal mucosa decreased.

74-0398. Litvinenko, P. M.; Kravtsov, B. N.; El'baum, L. Ya. (Tashkent Med. Inst., Tashkent, USSR). **Vliyaniye nekotorykh vitaminov na techeniye otravleniya khlorofosom v usloviyakh zharkogo klimata. [Effect of some vitamins on the process of chlorophos poisoning in a tropical climate.]** *Med. Zh. Uzb. 4: 19-21; 1973.* (Russian)

Mice were administered 100 μg of vitamin PP plus 100 μg of vitamin Bc, 100 μg of PP plus 10 μ of vitamin K3, 10 μg of Bc plus 10 μg of K3, or 100 μg of PP plus 10 μg of K3 through gastric tube with subsequent administration of 10 μg of atropine per g of body weight after poisoning. The mice were administered 1,200 mg of trichlorfon per g 30 min after introduction of the vitamins. The first symptoms of acute trichlorfon poisoning (irritation, tremor, muscular fibrillation, coma, and respiratory paralysis) appeared 3-10 min and 2-5 min after poisoning at 20-22 C and 40-41 C, respectively. All vitamin combinations reduced the lethality, which was, however, higher in the group exposed to 40-41 C than in that exposed to 20-22 C temperature.

The lethalities in the groups treated with PP + Bc, PP + K3, Bc + K3, and atropine + PP + K3 at 20-22 C were 70, 85, 85, and 45% after 24 hr, compared to a control value of 100%. The corresponding values for the groups exposed to 40-41 C were 80, 85, 95, and 60%, compared to 100% in the control group. Combinations of PP with Bc, and PP + K3 and atropine were most effective.

74-0399. Muminov, A. I. (Dept. Otorhinolaryngol. Path. Histol., Tashkent Med. Inst., Tashkent, USSR). **Patomorfologicheskiye izmeneniya vo vnutrennem ukhe pri khronicheskoy intoksikatsii geksakhloranom v eksperimente. [Pathomorphological change in the inner ear during experimental chronic poisoning by hexachlorane.]** *Med. Zh. Uzb. 4: 26-27; 1973.* (Russian)

Daily 1 mg/kg doses of hexachlorane were administered p.o. to rabbits for 180 days. Impairment of the auditory function and pathomorphological changes were parallel during the test period. Reisner's membrane became thin and broken, and mucus accumulated in the auditory canal. Edema, disintegration, plethora, and vasodilation were detected in the auditory canal. Thickening of the basal membrane, dystrophy of the auditory cells of the organ of Corti, homogenization of cytoplasm, pyknosis, and swelling and corrugation of the nerve cells of the auditory center with total tigrolysis were found.

74-0400. Walter, W. (Author address not given). **Der Einfluss von Herbiziden auf die Bodenatmung und Enzymaktivitaet von Weinbergboeden. [The influence of herbicides on soil respiration and enzyme activity in vineyard soils.]** *Mitt. Biol. Bundesanst. Land-Forstwirt. Berlin-Dahlem 146: 169-171; 1972.* (German)

The herbicides prefix (chlorthiamid), casoron (dichlobenil), semparol, domatol W Spez. and 1:1 mixture of gramoxone (paraquat) with reglone (diquat) were used during soil tests. Soil respiration, confirmed also by measurements of the dehydrogenase activity, was nearly at the control level in fields treated with reglone and gramoxone. The carbon dioxide production was lowest in soils treated with prefix and casoron without preliminary soil loosening; the same herbicides increased soil respiration over the control level in loosened soils. Prefix, casoron, domatol, and semparol increased the urease activity. The nitrogen trioxide level in soils treated with prefix and casoron was lower than in untreated soils; this is due to the inhibition of the nitrification of ammonia over nitrogen dioxide to nitrogen trioxide. The enzyme level of the herbicide-treated soils was in the normal to high range, indicating that the soil and microbial activity is not jeopardized by herbicides in soils with high humus levels.

74-0401. Daniel, J. W.; Bratt, H. (Author address not given.) **The metabolism of the systemic fungicide, ethirimol, by rats and dogs.** *Mitt. Biol. Bundesanst. Land-Forstwirt. Berlin-Dahlem 146: 268; 1972.* (German)

The absorption, excretion, and metabolism of the systemic fungicide, ethirimol (5-*n*-butyl-2-ethylamino-6-methylpyridimine), by rats and dogs was studied using ^{14}C-labeled doses of the preparation. Ethirimol was rapidly excreted in the urine following oral administration. Although ethirimol was quantitatively metabolized, the radioactivity detected in the urine was due mainly to five derivatives. Secondary alcohols formed through the last but one step of hydroxylation of the *n*-butyl substituent of ethirimol and the diethyl compound were the principal metabolites in both dogs and rats. Although ethirimol-*O*-glucuronide was isolated from the bile of the treated animals, other conjugated metabolites were not detected. Ethirimol or its metabolites did not accumulate in rats administered repeated doses of ethirimol.

74-0402. Joseph, S. R.; Mallack, J.; George, L. F. (Maryland State Board Agr., Off. State Entomol., College Park, MD 20742). **Field applications of ultra low volume malathion to three animal species.** *Mosquito News 32(4): 504-506; 1972.*

Malathion ULV applications of approximately 0.038 and 0.38 lbs/acre, directed at cages housing quail and mice and at tanks containing goldfish, did not affect the behavior of the test animals or their consumption of food. Diarrhea was not detected, and mortality observed was attributed to other causes since it was generally higher in controls than in treated animals. Red blood cell ChE was not inhibited at 24 hr after the last of 20 daily treatments. The results indicate that malathion ULV applications at 10 times the normal rate are not harmful to mice, quail, or goldfish.

74-0403. Nadzhimutdinov, K. N.; Muzrabekov, Sh. M.; Kamilov, I. K. (Dept. Pharmacol., Tashkent Med. Inst., Tashkent, USSR). **Vliyaniye geksakhlortsiklogeksana na deystviye geksenala i korazola. [Effect of hexachlorocyclohexane on the action of hexenal and corazole.]** *Med. Zh. Uzb. 4: 54-57; 1973.* (Russian)

BHC doses were introduced into the stomach of male albino rats 24 hr before similar administration of 95-110 mg of hexenal or 32-40 mg of corazole per kg of body weight. One of six 1/50 LD50 doses of BHC shortened the duration of hexenal-induced sleep by 14% and 56%, single and six 1/20 LD50 doses shortened it by 44% and 60.2%, respectively. BHC doses of 1/3 LD50 and 6 X 1/20 LD50 and 6 X 1/50 LD50 reduced the lethality caused by LD100 of hexenal by 50%, 30%, and 50%. The lessened action of hexenal is probably due to BHC's activation of the hepatic microsomal enzymes, and thus the intensification of the metabolism of hexenal in the liver. Single, 1/3 LD50 doses of BHC reduced the spasmogenic and toxic action of corazole by 40% and 66%, respectively. Six 1/20 LD50 doses reduced the spasmogenic and toxic action by 100%. The correspond-

ing figures for six 1/50 LD50 doses were 66% and 34%. This effect of BHC on spasmogenesis is due to its interference with the chemical transmission of pulses in the central nervous system and its blocking of the ganglion cells of the spinal cord and the diencephalon.

74-0404. Asanuma, N. (Japan Inst. of Rural Med., Usuda, Japan). **[Experimental studies on organophosphorus pesticide residues in living organisms, part 2.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 282-283; 1973.* (Japanese)

Single peroral doses of fenitrothion (300 mg/kg in olive oil) were administered to 30 male Wistar rats; groups of 5 rats were killed on days 1, 2, 5, 10, and 15 after administration, and blood and organs analyzed for fenitrothion and ChE activity. Fenitrothion levels on day 1 after administration were 0.363 ppm in blood, 1.392 ppm in brain, 2.529 ppm in liver, and 13.23 ppm in kidney; cholinesterase activity was 0.02 Δ pH in serum, 0.11 Δ pH in erythrocytes, 0.19 Δ pH in brain, 0.04 Δ pH in liver, and 0.02 Δ pH in kidney. On the fifth day after administration, fenitrothion concentrations averaged 0.004 ppm in blood, 0.013 ppm in brain, not detectable in liver, and 0.086 ppm in kidney. The ChE activities at this time were 0.03 Δ pH in serum, 0.10 Δ pH in erythrocytes, 0.11 Δ pH in brain, 0.08 Δ pH in liver, and 0.02 Δ pH in kidney. Fenitrothion was not detected on days 10 or 15, and ChE activity had returned nearly to normal on day 15. Fenitrothion was mostly excreted during the first 3 days after administration, 22% in the form of sulfates and glucuronates of *p*-nitro-*m*-cresol. Electron microscopic examination revealed changes in the synaptic vesicles of the neurolemma and denaturation of muscle fibers on the fifth day after administration; even on day 15, flattening and thickening of the junctional fold at the motor end plate of the ganglia and vacuolation of Schwann cells was seen.

74-0405. Matsushima, S.; Abe, E.; Shimazaki, K. (Japan Inst. of Rural Med., Usuda, Japan). **[Experimental studies on subacute toxicity of dichlorvos to monkey and rabbit.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 22(3): 296-297; 1973.* (Japanese)

Rabbits were given dichlorvos in olive oil p.o. at 0.2, 0.5, 1.5, and 5.0 mg/kg daily for three months; dichlorvos was also given to red-haired monkeys by injection into bananas at a level corresponding to 0.1, 0.3, and 1.0 mg/kg for six months. No clinical symptoms were apparent in either species. No abnormalities were found in blood and urine tests. Dose-dependent reductions in ChE activity were observed in various tissues. Eye examinations did not reveal abnormalities other than a refractive error of -1.0 to -2.0 D in monkeys in the highest dosage group. Cloudy swelling and epithelial congestion in kidney tubules as well as renal cortical necrosis were seen in rabbits in the high dosage group. Liver damage comprising congestion and centrilobular cloudy swelling was also marked in rabbits. Proliferation and edema of thyroid follicles in the initial stage of administration were followed by increasing nonuniformity and leakage of colloidal substance from the thyroid follicles. Under the electron microscope flattening of the junctional fold in the motor end plates of extraocular and intercostal muscles due to thickening of the basal membrane along with rarefaction and swelling of synaptic vesicles were seen.

74-0406. Yamamoto, T.; Iwasaki, Y.; Adachi, Y. (Kyoto Univ., Sch. Med., Kyoto, Japan). **[Liver enzyme induction.]** *Nippon Rinsho (Jap. J. Clin. Med.) 30: 1952-1965; 1972.* (148 references) (Japanese)

The mechanism of enzyme protein synthesis is often studied to examine protein synthesis in animal cells. Enzyme protein is considered a special kind of protein, and an understanding of the enzyme induction mechanism is significant in the efforts to analyze protein formation. During experiments on enzyme induction with various chemicals and drugs, chlordane was accidentally found to enhance hexobarbital metabolism. Enzyme induction by chlordane took longer than by phenobarbital, but enzyme activity was extraordinarily enhanced, as ascertained by electron microscopic observation of liver cells. It has been reported that 5 ppm of DDT also caused a similar enzyme activity increase. Other reports stated that DDT enhances degradation and excretion of dieldrin, and that a patient who had consumed a large amount of a barbiturate drug recovered quickly after DDT administration.

74-0407. Wiese, I. H.; Basson, N. C. J.; Basson, P. A.; Naude, T. W.; Maartens, B. P. (Plant Protection Res. Inst., Pretoria, S. W. Africa). **The toxicity and pathology of dieldrin and photodieldrin poisoning in two antelope species.** *Onderstepoort J. Vet. Res. 40(1): 31-40; 1973.* (13 references)

The mean cumulative lethal dose of dieldrin administered orally in the food of penned blesbuck was 9.07 mg/kg and that obtained in field applications was 1.90 mg/kg, values lower than any obtained previously for vertebrates. All of the blesbuck fed photodieldrin at a dose of 1.45 mg/kg died within 8 days, and the median lethal dose in field studies was 1.21 mg/kg. Springbuck were about 3 times more susceptible to photodieldrin, and rams were more sensitive than ewes. A dumb syndrome, in which blindness was common, was observed in addition to the violent nervous signs characteristic of organochlorine poisoning, especially in field cases. Degenerative lesions were observed in skeletal muscles, myocardium, kidneys, and liver with dieldrin or its photodecomposition product, as were congestion, edema and glial swelling of the brain.

74-0408. Hashimoto, Y.; Makita, T.; Nishibe, T.; Mori, T.; Ohnuma, N.; Noguchi, T.; Ohta, G. (BioMed. Res.

Div., Nisso Inst. Life Sci., Nippon Soda Co., Ltd., Oiso, Kanagawa, Japan). **Subacute toxicity of thiophanate-methyl in mice and rats.** *Oyo Yakuri (Pharmacometrics) 7(6): 929-945; 1973.* (23 references)

Thiophanate-methyl, fed at dietary levels of 12.8, 64, 320, and 1,600 ppm for 180 days, did not definitely affect growth, food consumption, or mortality in mice. At 8,000 ppm liver to body weight significantly increased in both sexes, and swelling, formation of acidophilic bodies, and irregular arrangement of hepatic cells also occurred. Liver and thyroid gland weights in rats increased at the same dose of 8,000 ppm. In rats growth, food consumption, hematology, urine composition, and clinical and histologic findings were not affected when the diet contained 12.8, 64, 320, or 1,600 ppm. Serum cholesterol and growth were affected by the 8,000 ppm dose. The no effect level in both species appeared to be 1,600 ppm.

74-0409. Hines, T.; Dimmick, R. W. (Tennessee Game Fish Comm., Rutledge, TN). **The acceptance by bobwhite quail of rodent baits dyed and treated with zinc phosphide.** *IN: Proceedings of the Twenty-Fourth Annual Conference, Southeastern Association of Game and Fish Commissioners, J. W. Webb, ed., Columbia, SC, 1970, pp. 201-205.* (3 references)

Zinc phosphide treated, black dyed oat groats posed relatively little hazard to bobwhite quail when distributed at the recommended dosage rates. At concentrations 10 times those used in rodent control programs only two birds died out of 25 exposed for 10 days. Results of studies of individual factors indicated that whole oats were eaten less than rolled oats, and black dyed oats were more repellent than undyed oats. Zinc phosphide also made the bait less acceptable to the quail.

74-0410. Hughes, J. S. (Louisiana Wild Life and Fish. Comm., LA). **Tolerance of striped bass, *Morone saxatilis* (Walbaum), larvae and fingerlings to nine chemicals used in pond culture.** *IN: Proceedings of the Twenty-Fourth Annual Conference, Southeastern Association of Game and Fish Commissioners, J. W. Webb, ed., Columbia, SC, 1970, pp. 431-438.* (15 references)

Nine chemicals were tested for toxicity to one week old larvae and one month old fingerling striped bass, *Morone saxatilis* (Walbaum). Higher concentrations of Karmex (diuron), potassium dichromate, potassium permanganate, and butyl ester of 2,4-D were required to kill fingerlings than larvae, yet fingerlings were more sensitive than larvae to parathion, methyl parathion, HTH, copper sulfate, or Dylox (trichlorfon). Copper sulfate, potassium permanganate, diuron, butyl ester of 2,4-D, HTH and parathion had 96-hr LC50s of 1 ppm or lower in larvae or fingerlings.

74-0411. Gregory, W. W., Jr.; Reed, J. D.; Wegg, L. G. (Dept. Entomol., Univ. Kentucky, Lexington, KY 40506). **Bioaccumulation of endrin from natural food sources in the eastern bobwhite quail, *Colinus virginianus virginianus* L.** *IN: Proceedings of the Twenty-Fifth Annual Conference, Southeastern Association of Game and Fish Commissioners, J. W. Webb, ed., Charleston, SC, 1971, pp. 156-164.* (23 references)

Bobwhite quail accumulated endrin in various tissues following administration of two types of food contaminated with the pesticide. Acute (single dose 190 μg) and chronic (210 μg over a 5-day period) administration of endrin on Mexican bean beetles resulted in a total accumulation of 16 and 22%, respectively, after 48 hr, and highest residues were observed in fat, liver, and gonad. Fat levels were 0.682 ppm after acute exposure and 0.421 ppm after chronic exposure, while levels in gonadal tissue (0.245 ppm) and liver tissue (0.201 ppm) from birds subjected to chronic exposure were higher than those from birds exposed to a single dose. When beans contaminated with endrin were fed to quail (0.15 mg endrin/kg), approximately 13% of the dose was retained. Residues were only detected in fat, liver, and gonad.

74-0412. Courtney, C. H.; Reed, J. K. (Dept. Entomol. Econ. Zool., Clemson Univ., Clemson, SC 29631). **Accumulation of DDT from food and from water by golden shiner minnows, *Notemigonus crysoleucas*.** *IN: Proceedings of the Twenty-Fifth Annual Conference, Southeastern Association of Game and Fish Commissioners, J. W. Webb, ed., Charleston, SC, 1971, pp. 426-431.* (9 references)

From 630 to 22,530 ppb total DDT were absorbed by golden shiners over a 2- to 15-day period from water containing an average of 265 ppt DDT. No plateau was reached during the 2-wk exposure, suggesting that equilibrium had not been attained. Over a 6-day period, the fish accumulated from 19 to 155 ppb total DDT from pelleted rat food containing 12 ng of DDT fed twice daily. No attempt was made to determine the distribution of metabolites in fish from either exposure.

74-0413. Berkessy, S.; Faludi, A. (Haemodialysis Unit Urol. Dept. Borsod County Hosp., 3501 Miskolc, Pf 188, Hungary). **The effect of exchange blood transfusion using the artificial kidney: experiments in vitro and clinical studies.** *Resuscitation 2: 9-16; 1973.* (32 references)

Exchange blood transfusion was used for treatment of a patient with paraquat poisoning, and the effects on the blood were noted. The patient, a 42-yr old man, had acute tubular necrosis and hepatic insufficiency and required a total of 9200 ml of citrated blood distributed over three treatments. A greater decrease of non-protein nitrogen and serum creatinine were observed during the first hour than is usually seen with simple hemodialysis. Potassium in the patient's blood remained

within the normal range, and serum calcium rose continuously. Bicarbonate concentration was initially low and reached normal by the end of the treatment. Serum bilirubin decreased significantly only during the last quarter of the exchange. The unique feature of this treatment is that citrated blood is dialyzed, the citrate removed, and the blood heparinized through the use of an artificial kidney before transfusion into the patient's circulation.

74-0414. Karki, A. B.; Coupin, L.; Kaiser, P.; Moussin, M. (Dept. Agr. Education and Research, HMG, Nepal). **Effets du chlorate de sodium sur les microorganismes du sol, leur respiration et leur activite enzymatique. I. Etude ecologique au champ. [Effects of sodium chlorate on soil microorganisms, their respiration and enzymatic activity. I. Ecologic field study.]** *Rev. Ecol. Biol. Sol 10(1): 3-11; 1973.* (12 references) (French)

Granulated sodium chlorate at a normal expenditure of 150 kg/ha was applied on weeded and freshly cleaned patches. Soil samples taken from the upper 20 cm layer 5, 27, and 150 days after sodium chlorate application were investigated. Sodium chlorate did not affect the number of total microflora, actinomycetes, cellulolytic, nitrifying, and ammonifying bacteria. In samples taken after 27 days, the rate of carbon dioxide formation was initially the same in treated and untreated soils, but it diminished subsequently in treated soil, indicating a decrease in total microbial metabolism. No differences were noticed between treated and untreated soil samples taken after 150 days. The dehydrogenase activity was decreased by sodium chlorate in samples taken after 5 and 27 days, but the difference greatly diminished by the 150th day. This is attributed to the appearance of oxygen from the chlorate which by that time had completely disappeared.

74-0415. Bingham, S. W. (Va. Water Resour. Res. Cent., Va. Polytech. Inst. State Univ., Blacksburg, VA). **Improving water quality by removal of pesticide pollutants with aquatic plants.** *Va. Polytech. Inst. Water Resour. Res. Cent. Bull. No. 58, 1973, 94 p.* (20 references)

Some species of algae and aquatic vascular plants removed herbicides from water and metabolized them to less active chemicals. Atrazine, amitrole, and 2,4-D, at levels much higher than those encountered in surface water, were generally not toxic to the three algae tested and were removed by at least one of the species, *Scenedesmus*. Removal of 2,4-D was light, temperature, and pH dependent. Both 2,4-D and amitrole, but not atrazine, were metabolized by the algae. At levels not inhibitory to the plants, atrazine, dicamba, dichlobenil, diphenamid, and amitrole were taken up by parrotfeather, waterhyacinth, waterthread, pondweed or elodea, and degradation of some of these herbicides was demonstrated. Dichlobenil residues in a treated farm pond were highest after 24 hr and decreased to the lower limits of detection by GC within 16 days after a stream was rechanneled through the pond.

74-0416. Gladenko, I. N.; Malinin, O. A.; Shulyak, V. D.; Kartashev, M. V.; Zaytseva, L. D. (Ukr. Sci. Res. Inst. Exp. Vet., USSR). **Deystviye sevina, dikrezila i khlorofosa na organizm ovets. [Effects of Sevin, dicresyl and chlorophos on sheep.]** *Veterinariya 7: 73-74; 1970.* (Russian)

Sheep were bathed with 0.1 and 0.25% emulsions of dicresyl, 0.1 and 0.85% emulsions of carbaryl, and 1% emulsion of trichlorfon to study the effects of these pesticides applied externally. Skin smears taken from sheep bathed one day earlier with 0.1 and 0.25% emulsions of dicresyl, 0.1 and 0.85% emulsion of carbaryl contained 1-2, 2-5, 1-2, and 2-5 $\mu g/cm^2$. Naphthol and cresols were also detected in the smears. Pesticide residue contents in the skin smears were reduced by 10 to 20 times in 3-5 days. Neither clinical symptoms of poisoning nor alterations of the skin and mucosa were evident. Hemoglobin, erythrocyte, leukocyte, and serum protein levels did not change significantly; phagocytic activity was not reduced. Cholinesterase activity decreased an average of 70% in sheep treated with 1% trichlorfon during the first four days after bathing. Serum alkaline phosphatase activity increased from 4.9 to 8.8 Bodansky units in some sheep. A similar increase from 5.2 to 7.2 units was observed in sheep treated with 0.85% emulsion of carbaryl. Blood inorganic phosphorus levels increased in animals treated with 1% emulsion of trichlorfon and 0.85% emulsion of carbaryl during the first 5 days. Hematologic and enzyme activities did not change in the other groups.

74-0417. Akulov, A. A. V.;Verkhovskiy, A. P.; Yevdokimov, S. M. (All-Union Inst. Exp. Vet., USSR). **K voprosu otravleniya zhivotnykh triallatom. [Triallate poisoning of animals.]** *Veterinariya 10: 105-106; 1972.* (Russian)

Triallate was administered orally in single 800, 300, and 600 mg/kg doses to hogs, sheep, and rabbits to determine toxicity. The clinical symptoms of poisoning in rabbits (anorexia, depression, pareses, muscular fibrillation, dyscoordination, hypersalivation, dyspnea, bradycardia, hypothermia) appeared in one day and continued for 10-15 days. Adynamia, depression, miosis, dyspnea, hypothermia, and tremor of the skeletal muscles occurred in sheep from the second hour after poisoning. Most of the animals died during the first two days. Emesis, hypersalivation, dyspnea, and defecation were observed in hogs which died during the first three days after poisoning. Pronounced, acute static hyperemia of the lungs, spleen, and kidneys; catarrhal inflammation of the respiratory submucosa; diffuse fatty infiltration in the liver with necrosis of hepatocytes; swelling and homogenization of the myocardial bundles; dystrophy and desquamation of the gastric epithelium; and active

hyperemia and serous edema of the pulmonary parenchyma and bronchi were diagnosed in histological investigations. Triallate is concluded to be a neurotropic poison.

74-0418. Poloz, D. D.; Trondina, G. A. (All-Union Inst. Exp. Vet., USSR). **Diagnostika otravleniy ptits metilnitrofosom. [Diagnosis of methylnitrophos poisoning in birds.]** *Veterinariya 10: 107-108; 1972.* (Russian)

Chickens diagnosed with acute poisoning from methylnitrophos (fenitrothion) are described. Blood acetylcholinesterase activity was reduced by 65-74% and normalized in 20 days. Acetylcholinesterase activity inhibition was accompanied by non-specific symptoms of poisoning such as plethora of the lungs, myocardium, liver, and kidney; edema; and hemorrhage of the gastrointestinal mucosa. A thin-layer chromatographic method for the detection of methylnitrophos and its metabolite, *para*-nitrocresol, in chicken excreta was elaborated. The pesticide was extracted with an organic solvent, after which the extract was purified and the solvent evaporated for chromatographic determination on alumina layer, using hexane-acetone as solvent system. The reaction with caustic soda was used for the detection and determination of methylnitrophos on the chromatogram. The sensitivity of the method lies at 0.25 mg/kg with an accuracy of 85%. Methylnitrophos and *para*-nitrocresol were detected in excrement from chickens with acute methylnitrophos poisoning from the first hour until eight days after poisoning.

74-0419. Leshchev, V. V.; Kan, P. T.; Talanov, G. A. (All-Union Sci. Res. Inst. Vet. Hyg., USSR). **Vydeleniye dursbana i diazinona s molokom. [Excretion of Dursban and diazinon in milk.]** *Veterinariya 10: 114-115; 1972.* (Russian)

Dursban (chlorpyrifos) and diazinon were excreted in milk of dairy cows following a single spraying with three liters of 0.2% emulsion of diazinon and of 0.15% emulsion of Dursban. Excretion of Dursban occurred for four days and excretion of diazinon for three days after the treatment of the cows. Highest Dursban and diazinon concentrations in the milk were 0.304 and 0.65 mg/l. respectively. Pasteurization at 90 C for 15 min and at 70 C for 30 min did not affect the diazinon residue level, but did reduce the Dursban concentration in the milk by 46.6 and 26.3%. Boiling and processing to sour milk reduced Dursban and diazinon residue contents by 52.5-65.4%, maximum.

74-0420. Khan, M. A. (Res. Station, Canada Dept. Agr., Lethbridge, Alberta, Canada). **Toxicity of systemic insecticides. Toxicological considerations in using organophosphorus insecticides.** *Vet. Rec. 92(16): 411-419; 1973.* (138 references)

In reviewing the toxicological considerations associated with use of organophosphate insecticides for the control of arthropod parasites of cattle and other farm animals, it is apparent that these compounds all induce symptoms characteristic of ChE inhibition although they differ in rate of absorption, degree of inhibition of specific ChE's, effect on recovery of ChE's, and interaction with other factors. Muscarinic signs generally appear first, followed by nicotinic signs such as tremors and paralysis. Central signs may or may not appear depending on the ability of the compound to cross the blood-brain barrier. Organophosphates are absorbed through the dermal, oral, parenteral, and respiratory routes, and effects may be more noticeable in a particular area depending on the route of absorption. Liver microsomal enzymes metabolize the pesticides. Alterations in enzyme activity affect their toxicity. Atropine and several oximes, including 2-PAM (pralidoxime), have been used effectively in treating poisoning by organophosphates in cattle.

74-0421. Schulz, D. (Max von Pettenkofer-Inst., Bundesgesundheitsamt, Berlin, Germany). **Beitrag zur allgemeinen Pathologie der Endokardreaktionen. Toxisch bedingte Endokardveraenderungen bei niederen Wirbeltieren (Karpfen). [Contribution to the general pathology of endocardial reactions. Toxic endocardial lesions in lower vertebrates (carp).]** *Virchows Arch. Path. Anat. Abt. A 358: 273-280; 1973.* (11 references) (German)

Carp were exposed to 0.1 to 12 ppm diuron concentrations for 40 days under laboratory conditions or in fish ponds to study diuron toxicity with special regard to endocardial lesions. Irritability, dyspnea, exophthalmus, anorexia, and weight loss were clinical signs of exposure. Changes were noted in the endothelial cells of the cardiac valves due to diuron concentrations of 0.1 ppm or more. The endocardial changes ranged from slight to marked with numerous granulomas. The severity of the histopathological changes depended on both the diuron concentration in the water and the duration of the exposure. No bacteria were demonstrable. The interstitial edema formation was localized inside the valves and subendothelial. Changes in the valves of the ostium atrioventriculare and ostium arteriosum affected 80% of the fish during the 40-day experiment.

74-0422. Buslovich, S. Yu.; Koldobskaya, F. D. (Belorussian Sci. Res. Inst. Sanit. Hyg., Minsk, USSR). **Aktivnost' geksokinazy skeletnoy myshtsy belykh krys pri eksperimental'noy miotonii. [Activity of hexokinase in skeletal muscles of albino rats in experimental myotonia.]** *Vop. Med. Khim. 18: 403-406; 1972.* (17 references) (Russian)

Myotonia was experimentally induced by the oral administration of 400 mg of 2,4-D per kg of body weight to the animals and by addition of sodium salt of 2,4-D to hormone preparation from skeletal muscles of adrenalectomized rats. The rate of the hexokinase inhibition reached 89% one hour after the administration of

400 mg 2,4-D. Hexokinase activity was totally suppressed in a few cases. The inhibitory effect of 2,4-D lasted about 24 hours. Similar effect of 2,4-D was observed in vitro after the treatment of the supernatant from muscle homogenate with 10 and 15 μM of 2,4-D sodium salt. The injection of 2,4-D into adrenalectomized and hydrocortisone-treated rats failed to cause myotonic response or decrease in the hexokinase activity. Hydrocortisone added to the enzyme preparation from skeletal muscles of 2,4-D-treated rats restored the hexokinase activity.

74-0423. Gavrilenko, Ye. V.; Orlova, N. V.; Pozdnyakov, A. L. (Lab. Pestic. Toxicol., Inst. Nutrition Acad. Med. Sci. USSR, Moscow, USSR). **Gigiyenicheskaya otsenka pshenitsy, vyrashchennoy na pochve, obrabotannom nerozinom. [Hygienic evaluation of the wheat grown on soil treated with nerosin.]** *Vop. Pitan. 31: 56-60; 1972.* (22 references) (Russian)

Wheat grain grown in a soil treated with a single 1.5 t/ha dose of nerosin and bread baked from such grain were fed to male and female Wistar rats for 12 months. Nerosin is composed of 8-12% paraffin, 15-20% olefins, 18-22% neutral oxygen compounds, and 20-30% phenols and naphthols. The cerebellar cholinesterase activity decreased 1.7-14.1%; the enterokinase activity and enterokinase level in the epithelium of the small intestinal mucosa were reduced 31.3-55.8%; weight gain decreased by 18.2-37.7%; mating intervals in the females lengthened up to 13-15 days; and growth rate of the newborn rats was reduced in the test groups fed grain and bread obtained from nerosin-treated soils. The bread itself was unsatisfactory since it had an after-taste and strange odor.

74-0424. Karakchev, N. I. (Author address not given). **O toksikologii gerbitsidov. (Obzor literatury.) [On the toxicology of herbicides. A literature survey.]** *Voyen. Med. Zh. 2: 47-50; 1973.* (9 references) (Russian)

Toxicological studies on herbicides and clinical observations concerning acute, subacute, and chronic poisonings with herbicides are surveyed. Irritation of skin and mucosa, headache, asthenia, emesis, alterations of the liver, cardiovascular system and the lungs, muscular hypotonia, anorexia, diarrhea, hypothermia, proteinuria, and paralysis of the extremities were observed due to acute poisoning with high doses of dichlorophenoxyacetic acid and trichlorophenoxyacetic acid derived herbicides. Paraquat caused dyspnea, anorexia, intensified mucus secretion, adynamia, hyperemia of internal organs, and sometimes hydrothorax and blood clotting. Nervous system damage, hemorrhage, headache, asthenia, nausea, catarrhal or purulent inflammation of the mucosa, bronchitis, pneumonia, epistaxis, cardiovascular insufficiency, and pulmonary edema are the basic symptoms of poisoning with trivalent arsenic compounds. Tributylphosphate and tributylthiophosphate inhibit cholinesterase activity, irritate the mucosa, and damage the parenchymatous organs. Intensification of oxidative processes, hyperthermia, and damages to the vascular system and parenchymatous organs were noted in dinitrophenol and dinitrocresol poisoning. Serous inflammation of the mucosa, tracheobronchitis, leukocytosis, anemia, degeneration of the parenchymatous organs, and toxic encephalopathy were observed in chronic and acute poisonings with the contact poison endothall.

74-0425. Lazutka, F. A. (Sci. Res. Inst. Exp. Clin. Med. Public Health Lithuanian SSR, Vilnius, USSR). **Eksperimental'nyye dannyye o lechenii ostrykh otraveleniy anabazin-sul'fatom. [Experimental data on the therapy of acute poisoning with anabasine sulfate.]** *Vrach. Delo 10: 137-140; 1972.* (Russian)

Spasmolytin (adiphenine hydrochloride) and tropicine were administered i.m. to albino rats poisoned with anabasine sulfate doses of 346, 519, and 692 mg/kg administered through gastric tube. The LD50 of anabasine sulfate, determined for treatment with adiphenine hydrochloride, was 570 mg/kg, and 403 mg/kg for treatment with tropacine. The LD16 and LD84 values determined for treatment with adiphenine hydrochloride and tropacine were 460 and 712 mg/kg and 288 and 498 mg/kg, respectively. Adiphenine hydrochloride and tropacine, administered i.m. in 20 mg/kg doses, reduced the LD50 of anabasine sulfate by 271% and 191%, respectively. Adiphenine hydrochloride and tropacine are recommended for clinical trials for the treatment of acute poisonings with anabasine sulfate.

74-0426. Viyevskiy, N. A.; Makovskaya, Ye.,I. (Dept. Pathol. Physiol., Vinnitsa Med. Inst., Vinnitsa, USSR). **Izucheniye allergennykh svoystv polikhlorpinena. [Study of the allergenic properties of polychloropinene.]** *Vrach. Delo 4: 132-135; 1973.* (5 references) (Russian)

Male and female guinea pigs were presensitized by sixfold administration of 30, 0.3, 0.003, and 0.00003 mg of polychloropinene, after which 200, 2, 0.02, and 0.002 mg doses were introduced i.v., intratracheally, or into the abdominal cavity. Polychloropinene produced allergenic effect which is significantly strengthened by Freund's adjuvant. Humoral antihaptenic factors took an active part in the development of the allergic reactions. The morphological changes observed (plasmatization of organs, lymphoid and histiocyte infiltration, increased permeability and necrosis of vascular walls) indirectly confirmed allergic reactions. Plethora with perivascular and pericellular edema; focal dystrophic and necrotic alterations in the brain; granular and fatty degeneration in the liver, kidney, and myocardium; hyperplasia and plasmatization of the peribronchial lymphoid tissue; inflammatory processes in the bronchi and alveoli; toxic edema, emphysema, and atelectasis; focal hemorrhages,

edema, and dystrophy in the adrenal gland, ovary, and hypophysis; and hyperplasia and plasmatization of some lymphatic follicles in the spleen were observed.

74-0427. Olefir, A. I. (Kiev Sci. Res. Inst. Ind. Hyg. Occup. Dis., Kiev, USSR). **Vliyaniye ostrogo otravleniya karbaminovymi pestitsidami na immunobiologicheskuyu reaktivnost'. [Effects of acute carbamate pesticide poisoning on immunologic responses.]** *Vrach. Delo 4: 138-141; 1973.* (7 references) (Russian)

Single, maximum tolerable doses of carbaryl, carbyne (barban), dicresyl, yalan (molinate), eptam (EPTC), tillam (pebulate), maneb, and thiram (400 mg/kg, 200 mg/kg, 150 mg/kg, 300 mg/kg, 1,000 mg/kg, 750 mg/kg, 1,000 mg/kg and 400 mg/kg, respectively) were administered to albino rats and the humoral, cellular, and barrier indices of non-specific immunity studied. With the exception of yalan and dicresyl, all other pesticides caused disturbances in the humoral, cellular, and barrier indices regarding the beta-lysine and lysozyme levels, the serum complement activity, the percentage of active neutrophils, the phagocytosis and digestion indices, the *Escherichia coli* counts on the skin and mucosa, and the bactericidal properties of the skin. Reduced serum bactericidal activity due to carbyne was noted. Acute poisoning with carbyne, eptam, and maneb reduced the immunological reactivity for one week, poisoning with carbaryl for more than two weeks, and the effect of tillam and thiram lasted for more than two months. Carbaryl, carbyne, tillam, and thiram increased the susceptibility of the animals to infection to some extent.

74-0428. Viyevskaya, G. A. (Dept. Psychiatr. Pathol. Anat., Vinnitsa Med. Inst., Vinnitsa, USSR). **Gistologicheskiye izmeneniya v organakh pri kompleksnom vozdeystvii polikhlorpinena i alkogolya. [Histological examination of organs after combined exposure to polychloropinene and alcohol.]** *Vrach. Delo 8: 119-122; 1973.* (4 references) (Russian)

Albino rats were fed 1.5-2 ml of 20% alcohol and/or 1/2,000 LD50 of polychloropinene per day for four months. The group given alcohol alone developed karyolysis and karyocytolysis of ganglion cells in the cerebral cortex and subcortical nuclei, swelling of the intimal endothelium, perivascular hemorrhages and plasmorrhagia, swelling of the myocardium, as well as vacuolization of liver parenchymal cells. The above changes were more pronounced in another group that was fed the same doses of alcohol together with polychloropinene. The latter group also displayed chromatolysis, ectopic nuclei, protein and sometimes fatty degeneration of the liver, and hyperplasia of spleen follicles with moderate proliferation of reticular cells and hemosiderosis. Respiratory tract findings included thickening of the interalveolar septum due to accumulation of lymphoid-histiocytic infiltrates, hyperplasia of peribronchial lymphoid tissue, edema, serous-desquamative bronchitis, emphysema, and focal atelectasis. The histopathological changes were most pronounced in the group exposed to both polychloropinene and alcohol. The animals fed polychloropinene developed a fondness for alcohol more readily than those in a control group.

74-0429. Olefir, A. I. (Kiev Inst. Ind. Hyg. Occup. Diseases, Kiev, USSR). **Vliyaniye khronicheskoy intoksikatsii karbaminovymi pestitsidami na immunobiologicheskuyu reaktivnost' i antiinfektsionnuyu rezistentnost'. [Effect of chronic carbamate pesticide poisoning on immunologic reactivity and infection resistance.]** *Vrach. Delo 8: 137-140; 1973.* (13 references) (Russian)

Albino rats were fed 1/20 LD50 doses of carbamate pesticides (26 mg/kg of carbyne (barban), 36 mg/kg of carbaryl, 20 mg/kg of dicresyl, 84 mg/kg of eptam (EPTC), 33 mg/kg of yalan (molinate), 56 mg/kg of tillam (pebulate), 150 mg/kg of maneb) and 1/50 LD50 or 37 mg/kg of TMTD five times a week for 4.5 months. Phasal deviations from normal with temporary normalizations in the humoral immunity (complement, lysozyme, beta-lysine contents, and serum bactericidal activity) were noted. The fluctuations in the lysozyme and complement levels were most pronounced and most frequent, and the beta-lysine level was rather stable. Thiocarbamates suppressed the humoral immunity to a higher extent than carbamates and dithiocarbamates did. Carbamates and TMTD caused pronounced impairment in the cellular immunity, manifesting itself mainly in the increased number of *Escherichia coli* on the mucosa. All pesticides considerably reduced the non-specific immunity at different times after the poisoning was started. Reduction in the infection resistance of the organism against *Escherichia coli* and *Staphylococcus* was observed.

74-0430. Karki, A. B.; Coupin, L.; Kaiser, P.; Moussin, M. (Serv. de Microbiol. du Sol, Inst. Pasteur, Les Metz, 78-Jouy-en-Josas, France). **Effets du chlorate de sodium sur les microorganismes du sol, leur respiration et leur activite enzymatique. [Effects of sodium chlorate on soil microorganisms, their respiration and their enzyme activity.]** *Weed Res. 13(2): 133-139; 1973.* (12 references) (French)

Sodium chlorate was applied in granular form at the normal dose of 150 kg/ha a.i. to field plots and the weeds either removed or allowed to remain. Samples to a depth of 0-20 cm were taken 5, 27, and 150 days after application from the treated plots and comparable controls to determine effects on soil microorganisms, their respiration and enzymic activity. Sodium chlorate did not affect the numbers of total microflora, actinomycetes, cellulolytic, ammonifying, nitrifying, or denitrifying bacteria. In samples taken after 27 days, evolution of CO_2 was initially the same in treated and untreated soils, but later diminished in treated soil, indicating a decrease

in total microbial metabolism. There were no differences in samples taken after 150 days. Dehydrogenase activity was decreased by sodium chlorate in samples taken after 5 to 27 days, but the difference was much less after 150 days; this is attributed to appearance of oxygen from the chlorate, which by that time had completely disappeared. (Author abstract by permission)

74-0431. Menashe, J.; Goren, R. (Dept. of Citriculture, Hebrew Univ. of Jerusalem, Rehovot, Israel). **Detoxification of fluometuron by *Citrus* tissues.** *Weed Res. 13(2): 158-168; 1973.* (13 references)

The metabolism of [^{14}C]fluometuron in *Citrus* was studied by feeding the herbicide to either young seedlings or to excised organs. Most of the uptake of fluometuron occurred via the roots during the first 24 hr and radioactivity was found after 16 days to be in the rootlets (36.5%), mainroot (34.5%), stem (13.7)% and leaves (15.2%). By feeding [^{14}C]fluometuron to excised organs it was established that although most of the fluometuron breakdown occurred in the rootlets, other plant parts were also capable of metabolizing the herbicide. Therefore, the presence of metabolites in the upper plant organs was not entirely due to translocation from the rootlets. These results suggest that the resistance of *Citrus* to fluometuron is due to its breakdown in the tissues, probably induced by an *N*-demethylase enzyme system, similar to that reported for cotton (Frear, Swanson & Tanaka, 1969), in which harmless metabolites are formed. (Author abstract by permission)

74-0432. Camper, N. D.; Moherek, E. A.; Huffman, J. (Dept. of Plant Pathol. and Physiol., Clemson Univ., Clemson, SC). **Changes in microbial populations in paraquat-treated soil.** *Weed Res. 13(2): 231-233; 1973.* (13 references)

Paraquat at 5.6, 22.4, and 112 kg cation/ha was broadcast to triplicate 7.5 X 4.8 m plots of Lakeland fine sand in August, 1970. Plots were cultivated to a depth of 15 cm at 3-month intervals. Soil samples collected 11 months after treatment were suspended and incubated on selective media for fungi, actinomycetes, and bacteria. Bacterial population in samples collected from plants treated with 5.6 g/ha increased 81% as compared to the control, but did not change at other treatments. At 5.6 kg/ha fungal population increased 45%; at 112 kg/ha fungal population decreased 51%. The actinomycete population did not change although an inhibitory trend is suggested at the 112 kg/ha dose. Organic matter contents of the plots varied considerably and at high paraquat doses the plots were devoid of vegetation for almost one year. The increases in bacterial and fungal populations at the low treatment rate might reflect utilization of paraquat as a nitrogen or carbon source, or selective action of paraquat on different species.

74-0433. Lee, S. S.; Griffin, D. A.; Fang, S. C. (Dept. of Agr. Chem., Oregon State Univ., Corvallis, OR 97331). **Identification of β-D-glucosides of ring-hydroxylated ureas in monuron-treated bean leaves.** *Weed Res. 13(2): 234-235; 1973.* (3 references)

Previous studies indicated the presence of three metabolite conjugates in monuron-treated bean leaves. In the present study, identities of two of these, *N'*(2-hydroxy-4-chlorophenyl)-*N*-methylurea (II) and *N'*(2-hydroxy-4-chlorophenyl)*N,N*-dimethylurea (III) were further confirmed by mass spectrometry of purified samples from β-glucosidase hydrolysis. The mass spectra contained peaks at 214/216 for molecular mass of III and 200/202 for II. The presence of several fragments in the spectra of metabolites II and III and their absence in the spectrum of monuron provided additional evidence that the hydroxyl group was attached to the ring of both metabolites. A small mass fragment of 72 in the spectra of monuron and III showed the presence of dimethyl isocyanate; m/58, methylisocyanate, was the prominent fragment in II. These metabolites are different from these isolated from cotton leaves.

74-0434. Murphy, J. J.; Didriksen, J.; Gray, R. A. (Stauffer Chemical Co., Agr. Res. Cent., Mountain View, CA 94040). **Metabolism of 2(α-naphthoxy)-*N,N*-diethyl propionamide in tomato.** *Weed Sci. 21(1): 11-15; 1973.* (1 reference)

Metabolism of the herbicide 2-(α-naphthoxy)-*N,N*-diethyl propionamide (R-7465) by tomato plants (*Lycopersicon esculentum* Mill. 'Mechanical Harvester') was investigated. Ring-labeled R-7465-^{14}C was taken up rapidly by the roots and distributed throughout the leaves within 8 hr. R-7465 was converted primarily into water soluble metabolites. The principal metabolite was identified as a hexose conjugate of 2-(α-naphthoxy-4-hydroxy)-*N,N*-diethyl propionamide. This metabolite represented 47% of the soluble radioactivity in the plant. A different hexose conjugate of 2-(α-naphthoxy-4-hydroxy)-*N,N*-diethyl propionamide together with a hexose conjugate of 2-(α-naphthoxy-4-hydroxy)-*N*-ethyl propionamide accounted for another 22% of the radioactivity. Nonmetabolized R-7465 was found to represent only 5% of the total soluble radioactivity. Other identified metabolites included 2-(α-naphthoxy)-*N*-ethyl propionamide, 2-(α-naphthoxy-5-hydroxy)-*N,N*-diethyl propionamide, and 1,4-naphthoquinone. None of these metabolites individually represented more than 3% of the soluble radioactivity in the plants. Ring hydroxylation and *N*-dealkylation appeared to be the initial steps in detoxification of R-7465 followed by conjugation with sugars. (Author abstract by permission)

74-0435. Schafer, D. E.; Stobbe, E. H. (Monsanto Co., St. Louis, MO 63166). **Translocation and metabolism of benazolin in wild mustard and rape species.** *Weed Sci. 21(1): 48-51; 1973.* (6 references)

The fate of 4-chloro-2-oxobenzothiazolin-3-ylacetic acid (benazolin) in wild mustard [*Brassica kaber*

(DC.) L.C. Wheeler var. *pinnatifida* (Stokes) L.C. Wheeler], turnip rape (*Brassica compestris* L. 'Echo'), and rape (*Brassica napus* L. 'Target') was investigated with the aid of ^{14}C-benazolin. The label was more mobile in wild mustard than the rape species following leaf treatment and accumulated in young leaves, stem, and stem apex. The label was also found in foliage after root treatment. In both cases, the translocated label was primarily that of ^{14}C-benazolin, implying phloem and xylem transport. The susceptibility of wild mustard and tolerance of the rape species to foliar-applied benazolin can be partly explained by different rates of transport to susceptible meristematic sites. Root exudation of the label following leaf treatment was greater in wild mustard than in the rape species and was not correlated with selectivity. Labeled benazolin was rapidly metabolized by the *Brassica* species to four derivatives which appear to be less toxic than benazolin. Specific differences in metabolism were not sufficient to explain selectivity. Negligible amounts of $^{14}CO_2$ were released by the three species following treatment with ^{14}C-benazolin. (Author abstract by permission)

74-0436. Arvik, J. H.; Hyzak, D. L.; Zimdahl, R. L. (Weed Res. Lab., Dept. Bot. Plant Pathol., Colorado State Univ., Fort Collins, CO 80521). **Effect of metribuzin and two analogs on five species of algae.** *Weed Sci. 21(3): 173-175; 1973.* (21 references)

Growth response of five species of soil algae to 4-amino-6-*tert*-butyl-3-(methylthio)-*as*-triazin-5(4H)one (metribuzin) and its 6-isopropyl and 6-cyclohexyl analogs were studied in vitro. Species of *Chlorella, Chlorococcum, Chlamydomonas,* and *Anabaena* were exposed to 0.05, 0.1, 0.5, and 1.0 ppm (w/v) of the herbicides in liquid nutrient, while a species of *Schizothrix* was studied at the same levels in soil culture. With one exception, the growth and numbers of all of the algae were significantly reduced by increasing herbicide concentrations. *Anabaena* was not affected by 0.05 ppm of the cyclohexyl analog. No growth was permitted by any of the herbicides at 1.0 ppm. *Chlorella* and *Chlamydomonas* could not grow in the presence of 0.5 ppm of metribuzin or the cyclohexyl analog. Differences in response to the triazinones were noted between species. *Chlamydomonas* was the most sensitive and *Anabaena* and *Chlorella* the most resistant. (Author abstract by permission)

74-0437. Koren, E.; Ashton, F. M. (I. Luxenbourg Chem. Corp. Ltd., Tel Aviv, Israel). **Influence of temperature on absorption, translocation, and metabolism of pyrazon in sugar beets.** *Weed Sci. 21(3): 241-245; 1973.* (13 references)

Autoradiographic studies showed that regardless of whether 5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone (pyrazon) was applied to the leaves or to the roots of sugar beet (*Beta vulgaris* L.) plants, it moved in the apoplastic system. The pattern of pyrazon distribution from root absorption in sugar beet seedlings was identical at either 35 or 18.3 C. However, root absorption at 35 C was twice as great as at 18.3 C; and translocation of pyrazon into the shoot was more rapid at the high temperature. A major metabolite of pyrazon, a pyrazon-glucose conjugate, was produced in leaves and cotyledons but not in roots of sugar beets. A minor metabolite, less than 5%, was found in sugar beet leaves. Pyrazon was not metabolized by the susceptible species common lambsquarters (*Chenopodium album* L.). The rate of pyrazon-glucose conjugate formation in pyrazon-infiltrated sugar beet leaf discs was practically identical at 35 and 18.3 C. Therefore, it was concluded that the increased susceptibility of sugar beets to pyrazon at high temperatures was due to an increase in absorption and translocation of the herbicide at higher temperatures which was not accompanied by a parallel increase in the conversion of pyrazon to its glucose conjugate. (Author abstract by permission)

74-0438. Sharma, M. P.; Vanden Born, W. H. (Dept. Plant Sci., Univ. Alberta, Edmonton, Alberta, Canada). **Fate of picloram in Canada thistle, soybean, and barley.** *Weed Sci. 21(4): 350-353; 1973.* (17 references)

Autoradiography and radioassay results indicated that ^{14}C-picloram (^{14}C-4-amino-3,5,6-trichloropicolinic acid) was absorbed and translocated rapidly in Canada thistle [*Cirsium arvense* (L) Scop.], soybean [Glycine max (L.) Merr. 'Harosoy 63'], and barley (*Hordeum vulgare* L. 'Parkland') following foliar or root application. Foliar absorption was much faster and more complete in soybean and Canada thistle than in barley. The radioactivity from ^{14}C-picloram accumulated in shoot meristems in Canada thistle and soybean, whereas in barley it was distributed throughout the plant following uptake by foliage or roots. Decarboxylation of ^{14}C-picloram by foliarly-treated Canada thistle, soybean, and barley plants did not occur in appreciable amounts. Chromatographic analysis of ethanol extracts of plants treated with ^{14}C-picloram up to 20 days revealed no evidence of picloram metabolism by these plant species. It is concluded that differences in absorption and in distribution patterns of picloram after shoot or root uptake contribute greatly to the expression of its selective action in the species studied. (Author abstract by permission)

74-0439. Armstrong, T. F.; Meggitt, W. F.; Penner, D. (Dept. Crop Soil Sci., Michigan State Univ., East Lansing, MI 48823). **Absorption, translocation, and metabolism of alachlor by yellow nutsedge.** *Weed Sci. 21(4): 357-359; 1973.* (8 references)

The main site of uptake of soil-applied 2-chloro-2',6'-diethyl-*N*-(methoxymethyl) acetanilide (alachlor) by yellow nutsedge (*Cyperus esculentus* L.) plants is the portion of the plant above the tuber. Primarily acropetal and some basipetal ^{14}C translocation occurred from ^{14}C-alachlor applications to seedlings with shoots 2 to 4

cm in length. Alachlor is metabolized rapidly in yellow nutsedge to at least one water-soluble metabolite. Applications of ^{14}C-alachlor to shoots 15 cm in length resulted in limited acropetal ^{14}C translocation. (Author abstract by permission)

74-0440. Penner, D.; Early, R. W. (Dept. Crop Soil Sci., Michigan State Univ., East Lansing, MI 48823). **Effect of alachlor, butylate, and chlorbromuron on carbofuran distribution and metabolism in barley and corn.** *Weed Sci. 21(4): 360-362; 1973.* (10 references)

The ^{14}C-labelled insecticide, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate (carbofuran), supplied to the roots of barley (*Hordeum vulgare* L. 'Larker') and corn (*Zea mays* L. 'Mich 400') seedlings was readily taken up and transported to the shoots. Alachlor [2-chloro-2′,6′-diethyl-*N*-(methoxymethyl)acetanilide] did not inhibit carbofuran metabolism in barley or corn. Butylate (*S*-ethyl diisobutylthiocarbamate) slightly inhibited carbofuran metabolism in corn roots. Chlorbromuron [3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea] inhibited carbofuran metabolism by decreasing the concentration of ^{14}C found in the acetone-insoluble residue and the methanol-soluble fraction in barley shoots. Chlorbromuron increased the carbofuran content and decreased the 2,3-dihydro-3-hydroxy-2,2-dimethyl-7-benzofuranyl methylcarbamate (3-hydroxycarbofuran) content of the chloroform-soluble fraction in both barley shoots and roots. Chlorbromuron did not affect carbofuran metabolism in corn. (Author abstract by permission)

74-0441. Hwang, S. W.; Schanker, L. S. (Nat. Inst. Environ. Health Sci., P. O. Box 12233, Research Triangle Park, NC 27709). **Absorption of organic arsenical compounds from the rat small intestine.** *Xenobiotica 3(6): 351-355; 1973.* (11 references)

The absorption of three organic arsenicals, injected directly into the small intestine of the rat in 5 m*M* solutions, was measured by determining the amount of unabsorbed material in the ligated intestine over a period of five hours. Half-lives of the three compounds were carbarsone, 87 min; tryparsamide, 184 min; and cacodylic acid, 201 min. Molecular size did not seem to affect absorption, but the greater the chloroform to water partition coefficient, the more rapid was the rate of absorption. The amount of drug absorbed was directly proportional to concentration, with the percentage remaining constant, suggesting that a non-saturable transfer process was operating.

74-0442. Douch, P. G. C. (Wallaceville Anim. Res. Cent., Min. Agr. Fish., Upper Hutt, New Zealand). **The metabolism of benomyl fungicide in mammals.** *Xenobiotica 3(6): 367-380; 1973.* (27 references)

Benomyl metabolites, identified as 2-aminobenzimidazole, 5-hydroxy-2-aminobenzimidazole, methyl benzimidazol-2-ylcarbamate, 1-butylcarbamoyl-2-aminobenzimidazole, methyl 5-hydroxybenzimidazol-2-yl carbamate, and methyl 1-(butylcarbamoyl)benzimidazol-2-ylcarbamate, were isolated from enzyme preparations of mouse liver, kidney, brain, and heart; sheep liver; and rabbit liver incubated with benomyl. Hydrolytic reactions did not require cofactors, but for oxidation reactions, cofactor requirements were similar to those found for other oxidation reactions. In vivo, the sulfates and glucuronides of 5-hydroxy-2-aminobenzimidazole, and methyl 5-hydroxybenzimidazol-2-ylcarbamate were formed from benomyl, and conjugates of the former were also observed after administration of 2-aminobenzimidazole. About 20% of the benomyl was hydroxylated, and 94-96% of the dose administered was excreted within 96 hours.

74-0443. Singh, B.; Gupta, K. G. (Dept. Microbiol., Panjab Univ., Chandigarh, India). **Effect of growth-regulating substances on the biomass and lipids of some fungi.** *Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg. 1: Orig. Reihe A 220: 554-563; 1972.* (28 references)

Both 1-naphthalene acetic acid (NAA) and 2,4-D stimulated the growth of five fungi at concentrations below 0.1 mg% and inhibited their growth at concentrations above 0.4 mg%. One other growth regulator, indole acetic acid (IAA), completely inhibited growth of *C. albicans* and slightly inhibited the growth of *M. canis*, *M. gypseum*, and *T. mentagrophytes* at 0.4 mg%. Giberrelic acid did not affect the dermatophytes, but markedly enhanced the growth of *C. albicans*. NAA and 2,4-D increased the acetone-soluble lipid fraction of all the fungi, and 2,4-D increased the phosphatide of *C. albicans* and *T. mentagrophytes*.

74-0444. Sadriyeva, R. V.; Absalyamov, I. F.; Glebkashanskaya, N. V. (Dept. Otorhinolaryngol., I. P. Pavlov Samarkand Med. Inst., Samarkand, USSR). **Dinamika morfologicheskikh izmeneniy slizistoy obolochki nosa krolikov, vyzyvayemykh malymi dozami sevina. [Dynamics of morphologic changes of the nasal mucosa, produced in rabbits by small doses of carbaryl.]** *Zh. Ushn Nos. Gorl. Bolez. 32: 7-9; 1972.* (4 references) (Russian)

Daily oral doses of 5 mg/kg of carbaryl were administered to rabbits for 120 days. Moderately pronounced hyperemia of the nasal mucous membrane and perivascular edema were observed during the first five days of the experiment. By the 11th to 14th day the number of histiocytes and lymphoid cells increased in the stratum submucosum. Roughening of the vascular elastic fibers and larger numbers of histiocytes and lymphoid cells in the stratum submucosum were observed on the 20th to 22nd day of the experiment. These changes were most pronounced on the 45th day of the experiment. At that time, the vascular changes decreased, and proliferative processes prevailed on the 100th day.

74-0445. Rengei, B.; Mindszenty, L.; Ember, M.; Csiszar, B. (Rechtsmedizinisches Inst., Univ. Szeged, Szeged, Hungary). **Die Wirkung einmaliger, oral gereichter Aethanolgaben auf die Cholinesterase-, GOT-, GPT-, alkalische Phosphataseaktivitaet und den Vitamin A-Spiegel des menschlichen Blutes mit besonderer Berucksichtigung der Vergiftungen mit organischen Phosphorsaeure Insekticiden. [The effect of a single oral ethanol dose on the cholinesterase, GOT, GPT, alkaline phosphatase activity and on the vitamin A level of human blood with special emphasis on poisonings with organic phosphoric acid insecticides.]** *Z. Rechtsmed. 73(1): 45-51; 1973.* (25 references) (German)

The effect of single oral doses of ethanol on the cholinesterase, GOT, GPT, and alkaline phosphatase activities as well as on the vitamin A level of the human blood was studied to detect the possible cause of the increased acute toxicity of organophosphorus pesticides when taken together with alcohol. Serum cholinesterase, alkaline phosphatase, GOT and GPT activities, and blood vitamin A levels were measured 1 to 4 hours after administration of single oral doses of 0.5, 1, or 1.5 g/kg of ethanol to five young normal subjects. No significant changes in these parameters in connection with corresponding changes of the blood alcohol levels were apparent. It is therefore concluded that the increased toxicity of organophosphorus pesticides taken simultaneously with alcohol is primarily due to the increased solubility of these poisons in alcohol and to the subsequently faster resorption.

See also **74-0260** **74-0264** **74-0266** **74-0267** **74-0287** **74-0306** **74-0311** **74-0466**

74-0446. Suzuki, K.; Miyashita, K.; Nagayoshi, H.; Kashiwa, T. (Agr. Chem. Inspection Station, Min. Agr. Forestry, Kodaira-shi, Tokyo, Japan). **Separation and identification of 20 pesticides in their mixture.** *Agr. Biol. Chem. 37(8): 1959-1962; 1973.* (8 references)

During a preliminary trial to establish a systematic identification and determination of a variety of pesticides, the separation of 20 such chemicals into several divisions was achieved, and the pesticides were roughly determined. The mixture was chromatographed on a column of silica gel, and five fractions were collected. Components were individually analyzed by TLC, UV, and GC according to published methods, necessary steps were taken to eliminate interference when it occurred. The compounds tested included: quintozene, *p,p'*-DDT, pentachlorophenyl acetate (fraction I); dichlofenthion, *p*-nitrophenyl 2,4,6-trichlorphenyl ether, endrin, nitrofen, and chlorfenson (fraction II); tetradifon, tetrachloroisophthalonitrile, dichlone, chlorpropham, and chlorobenzilate (fraction III); pentanochlor, swep, propazine, propanil, and chlorthiamid (fraction IV); and diuron and chloramphenicol. Some of the compounds occurred in two fractions, but more than 65% was generally found in one.

74-0447. Suzuki, K.; Nagayoshi, H.; Kashiwa, T. (Agr. Chem. Inspect. Sta., Min. Agr. and Forestry, Tokyo, Japan). **Systematic separation and identification of 13 carbamate pesticides in their mixture.** *Agr. Biol. Chem. 37(9): 2181-2184; 1973.* (7 references)

A TLC-GLC method was developed and tested for separation and identification of carbamates from a mixture. The pesticide mixture was applied to the TLC plate along with ACN (2-amino-3-chloro-1,4-naphthoquinone) as a marker. The chromatoplate was developed with hexane-dioxane at 40°C under circulating air. The chromatogram was divided into 4 groups; the bands of these groups were scraped and eluted with acetone. The extracts were permitted to react with ethyl acetate and trifluoroacetic acid anhydride, then the trifluoroacetyl derivatives examined by gas chromatography using PEGA and OV-17 columns at 150° and 200°C. The unchanged carbamates were eluted very late from a gas chromagraph, but the respective phenols were eluted close to the TFA derivatives. If present in large amounts, the phenols must be removed by washing with alkaline water. Recoveries of 13 pesticides tested were about 100%, except for APC (4-diallylamino-3,5-dimethylphenyl methylcarbamate) with a recovery of only 20%. The low recovery of the latter was due to decomposition on the TLC plate.

74-0448. Jenden, D. J.; Cho, A. K. (Dept. Pharmacol., UCLA School Med., Los Angeles, CA). **Applications of integrated gas chromatography/mass spectrometry in pharmacology and toxicology.** *Annu. Rev. Pharmacol. 13: 371-390; 1973.* (191 references)

A combination of GC and MS has been successfully applied in the determination of pesticides and chlorinated biphenyls. Magnetic sector instruments with a high mass range are used and have high resolution; quadrupole mass spectrometers are less expensive, have a mass range limit of 500, and only measure nominal masses of ions. Preparation for such analysis most frequently involves a series of extractions to remove interfering substances. After GC, carrier gas is removed by a molecular separator designed specifically for such separations. To achieve more sensitivity and selectivity than is achieved with MS scans, the mass spectrometer can be focused on a fixed mass/charge ratio.

74-0449. Kubelka, V.; Popl, M.; Mostecky, J. (Vysoka skola chemickotechnologicka, Prague, Czechoslovakia). **Stanoveni necistot v pentachlorfenolu. [Determination of impurities in pentachlorophenol.]** *Chem. Prumysl 23(6): 304-307; 1973.* (6 references) (Czech)

Technical pentachlorophenol contains a number of impurities, some of which are highly toxic. A preparation sold in Czechoslovakia, containing technical PCP from Dow Chemical Corp., was analyzed by the gas chromatographic method described by Rappe and Nilsson. In this method, chlorophenols are converted to the respective methoxy-derivatives by reaction with diazomethane because these derivatives are more easily separated than the phenols. Reaction conditions had to be modified experimentally to obtain earlier separation of components. Individual components were subsequently identified by gas chromatography in conjunction with mass spectrometry. Structural formulas of 10 substances were identified in this manner. The dominant impurity was tetrachlorophenol, followed by the *meta-* and *para-*isomers of 3,4,5,6-tetrachloro-2-(2,3,4,5,6-pentachlorophenoxy)phenol. Other impurities included pentachlorophenol and decachlorophenoxymethoxybenzene.

74-0450. Czegledi–Janko, G. (Orszagos Kozegesszegugyi Intezet, Budapest, Hungary). **Gas-chromatographische Bestimmung von alpha-, beta- und delta-Hexachlorcyclohexan-Spuren in Lindan. [Gas chromatographic determination of alpha, beta, and delta benzene hexachloride traces in lindane.]** *Chromatographia 6(2): 89-92; 1973.* (2 references) (German)

The usual gas chromatographic procedures developed for technical BHC are not suitable for determining α, β, and δ-isomers since the minute amounts of beta and delta BHC are obscured by the major component, gamma BHC. However, when using neopentyl glycol succinate or XF-1112 resin as stationary phases, the retention times differ so markedly that the other isomers can be detected in concentrations as low as 0.005%. Procedures included gas chromatograph with electron capture detector and direct injection, nitrogen as carrier gas, and two columns. One column used chromosorb and 2% neopentyl glycol succinate with

injection and column temperatures of 235 and 195 C; the other column incorporated chromosorb and 5% XF-1112 resin with injection, column, and detector temperatures of 235, 190, and 200 C. The lower limit of detectability for α-BHC is 0.01 ng. The corresponding values for δ and β-BHC are 0.001 and 0.01 ng.

74-0451. Thiel, W. (Staatliches Veterinaeruntersuchungsamt Krefeld, Krefeld, Germany). **Neue Methoden zum Nachweis gesundheitsschaedlicher Rueckstaende in vom Tier stammenden Lebensmitteln. [New methods of detecting harmful residues in foods of animal origin.]** *Fleischwirtschaft 53(2): 233-234; 1973.* (German)

The basic methods used for the determination of therapeutic drugs, antibiotics, vitamins, trace elements, prevalent environmental poisons, detergents, disinfectants, as well as organochlorine and organophosphorus pesticides and carbamates in foods of animal orgin are surveyed. Thin-layer chromatographic and gas chromatographic methods are generally used for determining pesticide residues in forage, fodder, and foods of animal origin, as well as in urine and feces. While thin-layer chromatographic analysis takes 8-14 hr, gas chromatographic procedures may require anywhere from 1 to 14 days. If examination of residues is to have any meaning, it seems essential that acceptable levels of all substances should be standardized by regulations at the national and international level.

74-0452. Anonymous. **Toxicology's need for new analytical methods.** *Food Cosmet. Toxicol. 11(1): 141-144; 1973.*

Steps must be taken to improve methods in toxicology in order to cope with the expected increases in toxic hazards resulting from pesticides an other forms of environmental pollution. GLC-MS has been used successfully in the field of pesticide determination, in which the most sophisticated methodology, from the toxicological viewpoint, is used. Single analytical procedures are seldom sufficient for identification of trace substances. Mass fragmentometry and electron probe microanalysis show promise as extremely sensitive analytical techniques.

74-0453. Ortner, G. (Organ. Anal. Lab., Bayer AG, Leverkusen, Germany). **Einfache Standardapparatur zur analytischen Bestimmung von schwefelhaltigen organischen Gruppen. [A simple standard apparatus for the determination of loosely bound organic, sulfur containing groups.]** *G-I-T (Glas-Instrum.-Tech.) Fachz. Lab. 17(2): 96-99; 1973.* (3 references) (German)

The apparatus is composed of a reflux cooler, a circulation type absorber, a bubble counter used as security absorber, another thermostatized absorber, and a second bubble counter. All or some of the elements are hooked up in different arrangements for the obtainment and absorption of sulfur containing gases from different organosulfur compounds by means of different absorbent liquids. The absorption of hydrogen sulfide or carbon disulfide from their mixtures is possible by absorption solutions such as cadmium acetate-acetic acid-potassium hydroxide-methanol and temperatures ranging from 10 to 25% in the different absorber steps. The apparatus can be used for measuring carbon disulfide released by breakdown of dithiocarbamate and thiuram compounds. It is particularly useful for analysis of dithiocarbamate-copper oxychloride mixtures.

74-0454. Komora, F. (Staatliches Holzforschungsinstitut, Bratislava, Czechoslovakia). **Quantitativer und qualitativer Nachweis von Pentachlorphenol in Holz. [Quantitative and qualitative determination of pentachlorophenol in wood.]** *Holz Roh- Werkst. 31(3): 106-110; 1973.* (19 references) (German)

Quantitative determination of the composition of technical pentachlorophenol is possible by a combination of gas chromatographic analysis with determination of total chlorine in the analyzed material. Provided the exact quantitative composition of pentachlorophenol, used for impregnation, is known, pentachlorophenol in wood can be analyzed indirectly by determining the total chlorine. If the exact quantitative composition of pentachlorophenol is not known, direct quantitative determination is possible by combining gas chromatographic analysis of the extract with determination of the total chlorine (calculation of the proportion of 2,3,4,6-tetrachlorophenol). Wickbold's method and that specified by the AWPA standard A 5-71 are suitable for the quantitative determination of organically bound chlorine in organic substances, including pentachlorophenols. Amidopyrine and 4-aminoantipyrine are specific agents for the quantitative determination of technical pentachlorophenol in wood.

74-0455. Caro, J. H.; Glotfelty, D. E.; Freeman, H. P.; Taylor, A. W. (Agr. Environ. Qual. Inst., Agr. Res. Serv., U.S. Dept. Agr., Beltsville, MD 20705). **Acid ammonium acetate extraction and electron capture gas chromatographic determination of carbofuran in soils.** *J. Ass. Offic. Anal. Chem. 56(6): 1319-1323; 1973.* (9 references)

A method is presented for determining carbofuran residues in soils that gives improved recovery, especially in weathered soils, and allows quantitation of as little as 0.1 ppm without cleanup. The soil is extracted with 0.5*M* acid ammonium acetate, and the carbamate in the extract is determined by electron capture gas chromatography as the dinitrophenyl ether. A systematic study was conducted to optimize extraction conditions. In tests of soils fortified with 1 ppm carbofuran, using optimized extraction conditions, recoveries varied with soil type, ranging from 61% in a peat to 92% in a silt loam. Recoveries of the metabolites 3-hydroxy- and 3-ketocar-

bofuran from field soils were at least as efficient as by HCl extraction. In addition to carbofuran, other methylcarbamate insecticide residues that may be determined by this method include Landrin, propoxur, and Bux. (Author abstract by permission)

74-0456. Cochrane, W. P.; Maybury, R. B. (Anal. Serv. Sect., Plant Prod. Div., Can. Dept. Agr., Ottawa, Ontario, Canada K1A OC5). **Chemical confirmation of BHC isomers: comparison of alkaline reactions in solution and by gas chromatographic pre-column.** *J. Ass. Offi. Anal. Chem. 56(6): 1324-1329; 1973.* (23 references)

A rapid procedure that involves treatment with sodium methoxide (NaOMe) solution is described for the qualitative confirmation of lindane (and other BHC isomers) residues in cereal, animal feed, meat, and fat samples. Losses encountered in the evaporation and partition steps are discussed. Optimum GLC conditions, both progammmed and isothermal, for the separation of the 1,3,5-, 1,2,4,-, and 1,2,3-trichlorobenzene products are given. Comparison of the NaOMe solution reaction with an alkaline pre-column technique revealed that the latter saved time in the analysis of cereal, animal feed, and cheese extracts. The alkaline pre-column method did not eliminate interferences in some meat and fat samples; the NaOMe solution reaction does eliminate these interferences. A lower level of 0.01 ppm lindane in a 10 g sample can be confirmed by the procedures described. (Author abstract by permission)

74-0457. Aharonson, N.; Ben-Aziz, A. (Pestic. Chem. and Residue Lab., Volcani Center, Bet Dagan, Israel). **Determination of residues of benomyl, its hydrolysis product, and thiabendazole in various crops.** *J. Ass. Offic. Anal. Chem. 56(6): 1330-1334; 1973.* (9 references)

An analytical procedure is described for residue determination of benomyl, its hydrolysis product 2-benzimidazole carbamic acid methyl ester (MBC), and thiabendazole (TBZ) in various plants. The method involves acetone extraction, partitioning between acetone-water and ethyl acetate, and cleanup on a magnesium oxide-Celite-alumina column. Benomyl is quantitatively converted on the chromatographic column to MBC, whereas TBZ is unchanged. The compounds are quantitatively measured by direct fluorometric measurement of either MBC or TBZ. The method is sensitive to 0.1 ppm benomyl and 0.02 ppm TBZ. The results from check samples have shown very good reproducibility and accuracy. (Author abstract by permission)

74-0458. Ives, N. F. (Div. Chem. Phys., Food Drug Admin., Washington, DC 20204). **Observations on the gas chromatography of kelthane (dicofol).** *J. Ass. Offic. Anal. Chem. 56(6): 1335-1338; 1973.* (12 references)

Problems associated with the GLC of Kelthane (dicofol) are discussed. The contribution of inlet glass wool to the decomposition of dicofol to *p,p'*-dichlorobenzophenone is investigated, and steps to minimize the problem are suggested. An impurity of the technical materials, which eluted immediately after dicofol, was isolated and tentatively identified as 1,1-bis(*p*-chlorophenyl)-1,2,2,2-tetrachloroethane. (Author abstract by permission)

74-0459. Bhagwat, V. M.; Ramachandran, B. V. (Biochem. Div., Nat. Chem. Lab., Poona-8, India). **Determination of malathion in enzymic digests by the ferric-hydroxamate method.** *J. Ass. Offic. Anal. Chem. 56(6): 1339-1342; 1973.* (12 references)

The ferric-hydroxamate method of Hestrin for the determination of esters, when applied to aqueous suspensions of malathion, yields low absorbance values; the molar absorbance indicates that only one ester groups is being hydroxamated. However, when the compound is dissolved in methanol the absorbance is doubled, both the ester groups presumably taking part in the reaction. With this modification the method is sensitive enough for routine assays of malathion residues. The absorbance is proportional to the amount of malathion between 0.5 and 2.0 μmoles. Malathion can be quantitatively recovered from aqueous media by a single extraction with cyclohexane. Aliquots of the extract are evaporated to dryness, and the residue is dissolved in methanol and assayed. The procedure described is suitable for the analysis of a larger number of samples, such as in malathion esterase studies, and may be used for the determination of malathion in formulations. (Author abstract by permission)

74-0460. Delfel, N. E. (Northern Regional Res. Lab., Agr. Res. Serv., U.S. Dept. Agr., Peoria, IL 61604). **Gas-liquid chromatographic determination of rotenone and deguelin in plant extracts and commercial insecticides.** *J. Ass. Offic. Anal. Chem. 56(6): 1343-1349; 1973.* (16 references)

Retention times on 3% methyl silicone in glass columns at 160°C were 0.85 and 1.39, respectively, for deguelin and stigmasterol acetate, the internal standard; and flame ionization detector responses were 1.00 and 1.47, respectively, compared to rotenone as 1.00 in both cases. Rotenolone, when present, interfered with the determination of deguelin. Rotenoid extracts from *Derris elliptica* and *Lonchocarpus nicou* roots lacked other interfering materials. *Tephrosia vogelii* leaflets contained fat-soluble contaminants that were minimized by using acetonitrile for extraction and by subsequent partitioning with hexane. When the GLC assay was applied to commercial samples, rotenone results were comparable to label values in 2 samples and rotenoid oxidation products were detected in 2 others. The precision of GLC was ± 4.1%, and the results agreed with those by thin

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layer densitometry (TLD) within 2.1% for rotenone and 2.9% for deguelin. A minor improvement of TLD for analysis of *T. vogelli* extracts is also described. (Author abstract by permission)

74-0461. Fuzesi, M. (Conn. Agr. Exp. Sta., New Haven, CT). **Gas-liquid chromatographic determination of Dursban insecticide (chlorpyrifos) in formulations.** *J. Ass. Offic. Anal. Chem. 56(6): 1350-1351; 1973.* (3 references)

A simple and rapid gas-liquid chromatographic method is described for the quantitative determination of chlorpyrifos in liquid and granular formulations. The sample is extracted with benzene, and equal amounts of sample and reference solution in the same concentration range are injected into a gas chromatograph equipped with an electron capture detector and an SE-30/Diatoport S column. Peak heights are used for quantitative measurements. The method has been applied successfully to laboratory-prepared and commercial samples. (Author abstract by permission)

74-0462. Johnson, L. G. (State Hyg. Lab., Univ. Iowa, Iowa City, IA 52242). **Formation of pentafluorobenzyl derivatives for the identification and quantitation of acid and phenol pesticide residues.** *J. Ass. Offic. Anal. Chem. 56(6): 1503-1505; 1973.* (9 references)

A procedure is described for the preparation and electron capture GLC determination of pentafluorobenzyl ester and ether derivatives of 2,4-D, *p,p'*-DDA, 1-naphthol, *p*-nitrophenol, and *sec.*-amyl phenols. A column cleanup procedure quantitatively isolates the derivatives from excess reagents and other interferences. The method can be used as an aid in the confirmation of the identity of pesticide residues and for the quantitative determination of extracted residues. (Author abstract by permission)

74-0463. Voss, G. (Agrochem. Div., Ciba-Geigy Ltd., Basel, Switzerland). **Semiautomated method for more precise and sensitive determination of nonpolar anticholinesterase insecticides with Technicon modules.** *J. Ass. Offic. Anal. Chem. 56(6): 1506-1507; 1973.* (6 references)

The problem of adsorption of relatively nonpolar anticholinesterase insecticides to Technicon proportioning pump tubing is now eliminated by manually injecting sample solutions into a special injection chamber just downstream from the pump, rather than pumping them through tubing. Experimental results demonstrate that the problems of cross-contamination, prolonged interwash periods, shifts of baselines, and reduced sensitivity are satisfactorily solved by this technical modification. (Author abstract by permission)

74-0464. Rappe, A.; Mauquoy, G.; Baur, S. (Ass. Pharm. Belge, B-1040 Brussels, Belgium). **Microbiological determination of thiram.** *J. Ass. Offic. Anal. Chem. 56(6): 1517-1518; 1973.* (12 references)

A rapid and simple agar plate method has been developed for the microbiological determination of thiram, using *Saccharomyces carlsbergensis* ATCC 9080 as the test organism. With this organism, as little as 25 ng thiram/well or 200 ng/disk can be detected with either *Bacillus licheniformis* or *Flavobacterium* as the test strain. The assay has been applied to a dietetic food preparation. (Author abstract by permission)

74-0465. Yamamoto, S. (Munic. Ind. Res. Inst., Osaka, Japan). **[Gas-chromatographic analysis.]** *Kagaku To Kogyo (Osaka) (Chem. Chem. Ind.) 46(12): 521-527; 1972.* (23 references) (Japanese)

Gas chromatographic analysis methods for organochlorine and organophosphate residues are presented. Sample preparation, extraction and cleanup methods for residues, and separation tubes, carriers, and fixed liquid phases are discussed. Various methods of BHC isomer analysis are compared. One method used in Japan is simultaneous GLC quantitation of α-, β-, γ-, and δ-BHC utilizing tetrachloro-*p*-quinone as the internal standard. Specifications are: 14 mg of sample, a stainless steel tube of 4 mm x 4 m, thermol-2 fixed liquid phase, carrier of Shimalite W, inlet temperature 215°C, hydrogen as carrier gas at 45 ml/min, and detector, TCD. The BHC isomers are analyzed in about one hour. Another method also developed in Japan utilizes a low concentration (1%) high polarity fixed liquid phase (PEG 6000). The carrier is Celite 545 (48-60 mesh), the inlet temperature is 175 C, carrier gas is He at 50 ml/min, and the detector is TCD. Acetone and BHC isomers are analyzed in a relatively short time. The method is highly reliable and is satisfactory for quality control analyses. OV-17 used as fixed liquid phase is excellent for analysis of ground water or drinking water pollutants such as organochlorine, organophosphate pesticides and herbicides. The inlet temperature should be about 198°C when analyzing methyl ester herbicide compounds, BHC isomers, and DDT compounds. For dieldrin and *p,p'*-DDE, the temperature should be about 175°C. The method is suitable for routine analyses.

74-0466. Ikramov, L. T.; Alimkhanov, O. A.; Galimdzhanova, S. G. (Dept. Toxicol. Chemistry, Tashkent Inst. Pharmaceut., Tashkent, USSR). **Khromatograficheskaya ochistka butifosa i fosfamida, vydelennykh iz biologicheskogo materiala. [Chromatographic purification of butiphos and phosphamide isolated from biological materials.]** *Med. Zh. Uzb. 4: 11-14; 1973.* (Russian)

A method for the chromatographic purification of butiphos (DEF) and phosphamide (dimethoate) is described along with the actual determination of butiphos and phosphamide residue in acutely poisoned rabbits. Butiphos and phosphamide are isolated from biological materials with ether and chloroform,

respectively. The extracts are condensed by evaporation and applied on silicagel layer for subsequent treatment with gaseous chloroform in the chromatograph chamber. The non-developed portions of the silica gel layer are scraped off the threefold elution of butiphos and phosphamide with acetone and chloroform, respectively. The rates of the elution of butiphos and phosphamide were determined to be 90.2% and 84.4%. The purified extracts thus obtained can be determined by means of chloroiodide and hydrobromic acid, provided the pesticide concentrations in the sample exceed 25 mg/100 g. The reaction of phosphamide with chloroiodide is suitable for the detection of a minimum pesticide quantity of 8 mg/100 g. Phosphamide and butiphos residue determinations in rabbits poisoned with single, large doses, revealed butiphos mainly in the gastrointestinal tract, kidney, liver and blood and phosphamide in nearly all organs.

74-0467. Wakimoto, T.; Tachikawa, R.; Ogawa, T. (Ehime Univ., Matsuyama, Japan). **[Gas liquid chromatographic determination of residues of the herbicide pentachlorophenol in the environment by derivatization with dimethylsulfate.]** *Nippon Dojo Hiryogaku Zasshi (J. Sci. Soil Anim. Fert. Jap.) 43(9): 344-348; 1972.* (3 references) (Japanese)

The ECD-GC analysis of residues of the herbicide PCP, especially in soil and water, is usually conducted by methylation with diazomethane, which requires a pre-experiment "cleanup" treatment. In the present report, dimethylsulfate was used for methylation and found satisfactory. Simply described, PCP is extracted from the test material, transferred into an alkaline solution in the form of the Na salt, and methylated with dimethylsulfate; then PCP-Me is extracted from the solution with *n*-hexane and is directly applied to GC. In several repeated operations, almost all of the PCP residue could be methylated with dimethylsulfate in alkaline solution. Three kinds of GC columns, 2% DC-200, 2% EGA, and 1.5% OV-17, were used; OV-17 showed particularly good separation and reliability, even in soil. The PCP recovery rate for water was 84-116%, and for soil 86-99%. Quantitation limits were 0.01 ppb for water and 1.0 ppb for soil. For the water analysis, 1 liter of test water (river and sea water) was extracted with benzene and extracted back with alkali; the solution was methylated with dimethylsulfate, and PCP-Me was extracted with *n*-hexane and applied to GC. For soil, 2-5 g of 2 mm sifted soil was shaken and extracted in 0.2 *N* sodium hydroxide solution; the supernatant alkaline layer was taken and methylated. The *n*-hexane extract was directly applied to GC.

74-0468. Kanazawa, J.; Masuda, T.; Iizuka, K.; Kamiji, M. (Pestic. Sect., Dept. Pathol. Entomol., Nat. Inst. Agr. Sci., Min. Agr. and Forestry, Tokyo, Japan). **[Methods for determining pesticide residues in soil and crops, part 1.]** *Nippon Dojo Hiryogaku Zasshi (J. Sci. Soil Anim. Fert. Jap.) 44(8): 301-308; 1973.* (Japanese)

Methods and procedures for determining pesticide residues in soil are outlined in a series of review articles. The first sections deal with general aspects and the remaining sections with individual problems. The initial section discusses detailed procedures for sampling soil and preparing soil specimens; for growing, sampling, and preparing crop specimens (the plant part to be analyzed is established for each crop by the Pesticide Inspection Station); and the solvents to be used for extracting pesticide residues. Extraction apparatus, such as horizontal shaker, separating funnel type shaker, electric mixer, blender, Soxhlet extractor, and ultrasonic washer; extraction procedures; methods of condensing extracts, expecially the Kuderna-Danish evaporator; and methods of cleanup, such as liquid-liquid partitioning, alumina and silica gel column chromatography, activated charcoal treatment, saponification for removal of fats, TLC, sweep codistillation, and steam distillation are briefly described.

74-0469. Babina, Yu. K.; Pakhomova, D. I. (Author address not given). **Izucheniye sostava metilmerkaptofosa metodom raspredelitel'noy khromatografii. [Study of the composition of methylmercaptophos by partition chromatography.]** *Probl. Anal. Khim. 2: 5-9; 1972.* (7 references) (Russian)

A partition chromatographic method may be used to determine the qualitative and quantitative composition of technical grade methylmercaptophos. The sample in chloroform was placed at the starting line on a silica gel layer. The technical preparation separates into seven components; these are visualized with iodine vapor or an acidic potassium permanganate spray. The thiol and thione isomer spots were identified by IR spectroscopy, and the other components were identified by comparison with standards of substances suspected to be present, using repeated chromatographic partitioning with such solvent systems as hexane-cyclohexane-benzene, hexane-acetone, as well as acetone and methanol. The presence of β-oxyethylsulfide, β-mercaptodiethylsulfide, and *O,O,O*-trimethylthiophosphate was comfirmed, but *O,O,O*-dimethylthiophosphoric acid chloroanhydride and dichloroanhydride were absent. For quantitative determination, the eluates containing the respective components are evaporated, and the individual components are determined from the weight of the respective dry residues. Except for an increase in the thiol isomer content, no change in the composition of technical methylmercaptophos before and after isomerization was observed. During storage for 1-2 months, shift in the proportion of the isomers toward the thiol isomers was noted.

74-0470. Babina, Yu. K.; Vershinin, P. V.; Kucherova, A. I.; Parfenov, A. I. (Author address not given). **Oprede-**

leniye summy khlorofosa i DDVF v stochnykh vodakh proizvodstva i prirodnykh vodakh. [Determination of the total chlorophos and DDVP in industrial waste waters and natural water.] *Probl. Anal. Khim. 2: 9-13; 1972.* (9 references) (Russian)

Two methods are presented for quantitative determination of the total chlorophos (trichlorfon) and DDVP (dichlorvos) residue contents in industrial waste waters and in natural waters. The first (colorimetric) method is based on the fact that trichlorfon and DDVP form a yellow complex with an acetone solution of *o*-toluidine in an alkaline medium in the presence of hydrogen peroxide. The yellow complex is quantitatively extracted from the aqueous solution with benzene and chloroform. The absorption peak is in the range of 400-405 nm. The second (thin-layer chromatographic) method is based on the semiquantitative hydrolysis of trichlorfon to DDVP in water at pH 7. The DDVP is extracted with chloroform and transferred to a silica gel layer. A benzene-methanol system is used for separation and visualization is done with soda and resorcinol solutions.

74-0471. Babina, Yu. K.; Kucherova, A. I. (Author address not given). **Metody opredeleniya khlorofosa i DDVF v tekhnicheskikh produktakh. [Determination of chlorophos and DDVP in technical products.]** *Probl. Anal. Khim. 2: 14-17; 1972.* (7 references) (Russian)

Chlorophos (trichlorfon) can be determined in technical grade pesticide preparations by potentiometric titration using ethanol as solvent and a 0.5*N* alcoholic solution of potassium hydroxide or aqueous solution of sodium hydroxide as titrant. In the absence of phosphorous acid, two instead of three potential jumps are obtained in the potentiometric titration. The sum of DDVP (dichlorvos) plus trichlorfon can be determined by spectrophotometric measurement of the optical density of the colored complex formed by trichlorfon and DDVP with acetone in an alkaline medium. The absorption spectra are measured in the range of 350-420 nm, the absorption peak being at 370 nm. Thin-layer chromatography with silica gel as sorbent, and 9:1 chloroform-methanol solvent system is applied for the identification of trichlorfon and DDVP in technical products.

74-0472. Vayntraub, F. P.; Dron', L. P. (Author address not given). **Kachestvennoye i kolichestvennoye opredeleniye kaptana i ftalana v vine, vinogradnom soke, list'yakh i yagodakh vinograda, yablokakh, pochve i vode. [Detection and determination of captan and phthalan in wine, grape juice, grape leaves and berries, apples, soil, and water.]** *Probl. Anal. Khim. 2: 17-20; 1972.* (9 references) (Russian)

Thin-layer chromatography is used for detection and preliminary separation; a colorimetric resorcinol method is used for quantitative determination of captan and phthalan (folpet) in vineyard materials. Captan and phthalan are extracted with benzene. The dry extract obtained after evaporation of the benzene is transferred without preliminary cleanup to a chromatographic plate together with a standard solution, using benzene as solvent. Visualization is done with an ammoniacal solution of silver nitrate under UV light. The retention times of captan and phthalan are 0.3-0.35 and 0.55, respectively. The minimum detectable amount is 5 μg in apples, soil, and water and 0.5 μg in wine and grape juice. For quantitative determination, non-visualized spots are scraped and eluted with benzene to yield a solution for individual colorimetric determination of captan and phthalan with resorcinol.

74-0473. Vekshteyn, M. Sh.; Klisenko, M. A. (Author address not given). **Sovremennyye metody opredeleniya ostatochnykh kolichestv ditiokarbamatov v razlichnykh sredakh. [Determination of residual quantities of dithiocarbamates in various media.]** *Probl. Anal. Khim. 2: 21-27; 1972.* (10 references) (Russian)

Dithiocarbamate residues in plant and biological materials are determined by a color reaction of carbon disulfide released during acid hydrolysis with copper acetate, yielding copper diethyldithiocarbamate of a dark brown color. The catalytic reaction of iodine with azide results in even higher sensitivity. The reaction is conducted in a 4:1 mixture of methanol with dimethylformamide. Methods based on the complex formation of dithiocarbamates with such heavy metals as cobalt and copper have sensitivities of 3-5 μg. Ziram dissolved in chloroform or acetone can be determined polarographically at a sensitivity of 0.4-0.5 mg/kg. Polarographic methods are also suitable for the determination of metal derivatives of ethylene-bis-dithiocarbaminic acid without preliminary cleanup. The thin-layer chromatographic method, using an alumina layer as adsorbent and iodine azide as visualizing agent, provides a sensitivity of 0.1-1 μg. Thin-layer chromatography is efficiently combined with UV spectrophotometry for residue identification. The thin-layer chromatographic method is suitable for the identification and quantitative determination of dithiocarbamates and their metabolites in plant tissues.

74-0474. Vergeychik, T. Kh. (Author address not given). **Fotometricheskoye opredeleniye khlorfenolov v tekhnicheskikh gerbitsidnykh preparatakh gruppy 2,4-D. [Photometric determination of chlorophenols in technical herbicidal preparations of the 2,4-D group.]** *Probl. Anal. Khim. 2: 28-32; 1972.* (11 references) (Russian)

The photometric method for qualitative and quantitative determination is based upon the interaction of chlorophenols with pyramidone in an alkaline medium (ammonia) in the presence of potassium ferricyanide. The reaction product, of orange-red color, is quantitatively extracted with *n*-butanol. The use of pyramidone instead of 4-aminoantipyrine, as accepted in the conven-

tional colorimetric method, results in a five-fold increase in sensitivity. The absorption spectrum of the colored compound in aqueous solution has a peak at 510 nm. The absorption spectrum of the colored compound, extracted with *n*-butanol, has a peak at 480 nm. The 2,4-dichlorophenol reacted with pyramidone in a ratio of 1:2. The minimum detectable amount of chlorophenols lies at 0.4 μg in 1 ml solution.

74-0475. Vylegzhanina, G. F.; Kalmykova, R. G. (Author address not given)) **Kachestvennyy i kolichestvennyy metody opredeleniya fozalona v yablokakh i yablonevykh lit'yakh. [Detection and determination of phosalone in apples and apple tree leaves.)** *Probl. Anal. Khim. 2: 32-38; 1972.* (5 references) (Russian)

A thin-layer chromatographic method for the detection and an improved variant of Laurent's spectrophotometric method for the quantitative determination of phosalone in apples and apple tree leaves are described. For identification, the phosalone residue is extracted with benzene. The benzene extract is cleaned up on a column of anhydrous sodium or activated charcoal, or by vacuum microsublimation for removal of waxes and pigments. Phosalone is then eluted with methylene chloride. Chromatographic identification is done on a silica layer. A 6:4 mixture of benzene and petroleum ether is used as solvent, and bromophenol blue, silver nitrate in aqueous acetone, ammoniacal solution of silver nitrate in acetone, as well as UV light are used for visualization. The quantitative spectrophotometric method is based on the alkaline hydrolysis of the sample in alcoholic solution in which diethyldithiophosphoric acid is obtained. The latter reacts with copper to form a yellow copper salt. The respective sensitivities of the quantitative and qualitative methods of phosalone determination are 10-20 μg and about 2 μg.

74-0476. Girenko, D. B.; Klisenko, M. A. (Author address not given). **Opredeleniye nekotorykh pestitsidov v ob"ektakh vneshney sredy metodom gazozhidkostnoy khromatografii. [Determination of some pesticides in environmental materials by gas-liquid chromatography.]** *Probl. Anal. Khim. 2: 39-43; 1972.* (6 references) (Russian)

A gas chromatographic method using an electron capture detector for the qualitative and quantitative determination of organochlorine and organophosphorus pesticide residues in air, water, and biological materials is described. Test conditions include a stainless steel column, 3 mm in diameter, packed with 10% Chromosorb W on DC-200, column and detector temperatures of 200°C, and a nitrogen carrier gas flow rate of 120 ml/min. The incomplete separation of peaks for the organophosphorus compounds was due to the presence of impurities in the technical preparations. Analyses of mixtures of organochlorine and organophosphorus pesticide residues revealed coinciding peaks of dimethoate with lindane, heptachlor with methyl parathion, and aldrin with parathion. However, these overlaps are not expected to present a problem since the probability of simultaneous presence of these pairs of pesticides in the same sample is low. The electron capture detector was substantially less sensitive to organophosphate pesticides than to organochlorines. The sensitivity of the method is 5μg/kg.

74-0477. Dyatlovitskaya, F. G.; Gladenko, Ye. F.; Kruchinina, A. A. (Author address not given). **Metody opredeleniya khlororganicheskikh insektitsidov v vode vodoyema. [Determination of organochlorine insecticides in reservoir water.]** *Probl. Anal. Khim. 2: 43-46; 1972.* (6 references) (Russian)

Methods for the detection and quantitative determination of ovex, DDT, BHC, heptachlor, aldrin, and dieldrin in reservoir water are described. Following twofold extraction with benzene, ovex is dissolved in ethanol, hydrolyzed with alcoholic KOH, and determined colorimetrically with 4-aminoantipyrine. Quantitative determination against a calibration curve gives a sensitivity of 0.2 mg/l. The benzene extract of DDT is dissolved in ethanol, nitrated, and the tetranitro product is extracted with ether. The dry residue is dissolved in benzene, and the solution is condensed with potassium hydroxide solution in methanol. The presence of DDT is indicated by a blue color. A paper chromatographic method with acetone-water 7:3 as solvent, and detection using an ammoniacal solution of silver nitrate in acetone followed by UV irradiation is also used for the determination of DDT in water. Paper chromatography with acetone-water 7:3, and an alkaline solution of diethanolamine as visualizing agent is applied to heptachlor residues in water.

74-0478. Yermakov, V. V. (Author address not given). **Opredeleniye khlorsoderzhaschikh pestitsidov metodom gazo-zhidkostnoy khromatografii. [Determination of chlorine-containing pesticides by gas-liquid chromatography.]** *Probl. Anal. Khim. 2: 46-50; 1972.* (9 references) (Russian)

The gas-liquid chromatographic determination of the α-, β-, γ-, and δ-isomers of BHC; heptachlor; technical grade DDT; TDE; methoxychlor; perthane; and kelthane using an electron capture detector is described. The pesticides were dissolved in *n*-hexane, benzene, or acetone. Helium at a flow rate of 10-32 ml/min and argon with methane as detector flushing gas were used. Column temperatures of 190°, 200°, 260°, and 290°C were used for the determination of DDT, heptachlor, and BHC. Good separation of perthane, α- and δ-BHC, heptachlor, and methoxychlor was observed. Kelthane gave three different peaks. DDT and TDE also had two basic peaks, one of them coinciding with one of the kelthane peaks. Increased sensitivity of the electron capture detector for chlorine-containing cyclic compounds

was noted. This gas-liquid chromatographic method was used in the determination of BHC and DDT in various biological materials such as meat, milk, fats, and fodder. The organic matter was first digested with sulfuric acid, then BHC was extracted with hexane and water vapor. The sensitivity for BHC was 4 μg/kg.

74-0479. Kadysh, V. P.; Ozolinya, N. Ya.; Stradyn', Ya. P.; Egert, V. E. (Author address not given). **Analitcheskiye metody opredeleniya rodentitsidov 2-atsilindandionovogo ryada. [Determination of rodenticides of the 2-acylindandione series.]** *Probl. Anal. Khim. 2: 51-58; 1972.* (3 references) (Russian)

Analytical methods for the identification and quantitative determination of residual amounts of rodenticides of the 2-acylindandione series such as diphenazine, pentolazine, and chlorophenazone are described. A colorimetric method for the quantitative determination of such rodenticides is based on the formation of a colored complex upon mixing a solution of the rodenticide in dioxane with ferric chloride solution. The color follows the Beer-Lambert law in a concentration range of 0.05-0.3 mmol/l. Acylindandiones can also be determined spectrophotometrically using the intense absorption band of the anionic form in alkaline milieu at 285 nm. The optical density follows the Beer-Lambert law in a concentration range of 5-20 μmol/l. Polarography is suitable for the quantitative determination of acylindandiones and for determination of the direction of enolization in solutions. The acidimetric method, comprising titration of acetone solutions of the acylindandione samples with 0.1 *N* potassium hydroxide in isopropyl alcohol in the presence of bromthymol blue indicator, is also suitable for quantitative determination. Analytical results obtained by acidimetric and colorimetric methods are usually higher than results obtained by spectrophotometry and polarography.

74-0480. Koneva, T. N.; Kutsenogiy, K. P. (Author address not given). **Analiz aerozoley, soderzhashchikh DDT i gamma-GKhTsG, polyarograficheskim metodom. [Polarographic analysis of aerosols containing DDT and gamma-hexachlorocyclohexane.]** *Probl. Anal. Khim. 2: 58-61; 1972.* (4 references) (Russian)

For polarographic quantitative determination of DDT and lindane the aerosol is passed at 100-200 l/min through an APHA type filter. The pesticide residue is extracted from the filter with ether. The dry residue is dissolved in an 0.01 *N* solution of tetramethylammonium bromide in 80% ethanol-benzene for polarographic determination. To avoid a summation wave of DDT and lindane in the polarographic determination of mixtures, the sample is diluted to about 270% of the original volume with 0.01 *N* tetramethylammonium bromide. The solution to be analyzed was prepared in 80% ethanol for subsequent polarographic analysis with addition of DDT standard solution and without such standard. Afterwards, the sample was diluted and analyzed with and without addition of lindane standard solution. The sensitivity of the method is 25 μ*M* for DDT and 19 μ*M* for lindane.

74-0481. Klisenko, M. A.; Aleksandrova, L. G. (Author address not given). **Primeneniye spektrofotometrii v UF- i IK-oblastyakh spektra dlya opredeleniya ostatochnykh kolichestv karbina. [Use of UV and IR spectrophotometry for determination of residual amounts of carbyne.]** *Probl. Anal. Khim. 2: 61-66; 1972.* (4 references) (Russian)

UV and IR spectrophotometric procedures for the determination of carbyne (barban) residues in air, blood, organs, and plant materials are described. Carbyne is extracted from air filter materials with diethyl ether, then the dry residue is dissolved in ethanol for measurement of the optical density at 276 nm. Quantitative determination is done against a calibration curve. The same procedure is applied to the determination of carbyne in blood following extraction with *n*-hexane. For the determination of carbyne in plant materials partition chromatography with hexane-acetonitrile is used prior to measurement of the optical density at 276 nm, with a sensitivity of 4 mg/kg. The IR spectrophotometric determination, requiring a minimum of 300 μg, uses the characteristic bands at 705, 790, 870, 1025, 1040, 1200, 1600, and 1760/cm. Metabolism of carbyne into aromatic amines, aniline, and chloroaniline in rats was determined by IR spectrophotometry.

74-0482. Kosmatyy, Ye. S.; Tret'yak, M. G. (Author address not given). **Khromatograficheskoye opredeleniye ostatkov *O,O*-dimetil-*S*-(1-karbetoksibenzil)-ditiofosfata (tsidial) v yablokakh. [Chromatographic determination of residues of *O,O*-dimethyl-*S*-(1-carbethoxybenzyl)dithiophosphate (cidial) in apples.]** *Probl. Anal. Khim. 2: 66-70; 1972.* (12 references) (Russian)

A combined thin-layer chromatographic and polarographic method for the detection and quantitative determination of cidial (phenthoate) residues in apples is described. Apples are mixed with sodium sulfate and dimethylformamide and blended; residues are extracted from dimethylformamide with benzene. The benzene extract is purified on an activated magnesium trisilicate column. Cidial is eluted with benzene for identification on a silica gel thin layer. Acetone-*n*-hexane is the solvent and brilliant green in acetone or a 5% solution of methanol yellow in 50% ethanol is the visualization reagent. If subsequent polarographic determination is desired, equal proportions of a 2% aqueous solution of silver nitrate and a 0.4% solution of bromophenol blue in acetone can be used as visualizing agents for chromatographic identification. The eluate from the thin layer is quantitatively transferred into a polarographic cell for quantitative polarographic determination. The sensitivity

of the thin-layer chromatographic and polarographic methods is 5 μg and 100 μg/kg, respectively.

74-0483. Makarova, S. V.; Soboleva, D. A. (Author address not given). **Spektrofotometricheskoye opredeleniye novogo gerbitsida meturina. [Spectrophotometric determination of the new herbicide meturin.]** *Probl. Anal. Khim. 2: 73-76; 1972.* (2 references) (Russian)

An alcoholic solution of technical meturin is mixed with ferric chloride solution to form a colored complex which is then extracted with chloroform for subsequent spectrophotometric determination. The color of the chloroform extract is stable for at least 2 hr in a pH range of 1.8-2.8. A fivefold ferric ion excess is used to obtain stable color. The colored complex has characteristic absorption maxima at 302 and 420 nm. The applicability of the spectrophotometric method to meturin residue analysis is being studied.

74-0484. Mamina, F. A.; Akhunov, T. F.; Gerasimova, A. I.; Sharif'yanova, L. N.; Lomot'ko, I. N. (Author address not given). **Analiz butilovogo efira 2,4-dikhlorfenoksiuksusnoy kisloty. [Analysis of the butyl ester of 2,4-dichlorophenoxyacetic acid.]** *Probl. Anal. Khim. 2: 77-80; 1972.* (7 references) (Russian)

A gas-chromatographic method for the determination of 2,4-DB and a photometric method for the determination of chlorophenols are described. Silicone oil FM 1322/300, applied on 60-100 mesh brick, was best for the separation of chlorophenoxyacetic acid butyl esters. A chromatograph with a thermal conductivity detector, a column temperature of 180°C, a helium flow rate of 150 ml/min, and 2,4-D methyl ester as internal standard were used for the gas-chromatographic determination. Fairly good separation of all components with the exception of *p*- and *o*-phenoxyacetic acid butyl esters was achieved. Chlorophenols are determined by photometric measurement with 4-aminoantipyrine and potassium ferricyanide blue in bromate buffer, pH 8.1, and acetone at 510 nm. Preliminarily, 2,4-DB is hydrolyzed for 5 min in acetone-water solution of sodium hydroxide. The optical density was highest for 2,6-dichlorophenol and lowest for *p*-chlorophenol.

74-0485. Molochnikov, V. V.; Mochalov, V. I. (Author address not given). **Ekstraktsiya pestitsidov iz moloka i ochistka ekstraktov dyla analiza. [Extraction of pesticides from milk and cleanup of the extracts for analysis.]** *Probl. Anal. Khim. 2: 81-84; 1972.* (3 references) (Russian)

A method for the extraction of DDT, DDE, and DDD (TDE) residues from milk for analysis is described. Milk is mixed with potassium oxalate solution, acetone, saturated solution of sodium chloride, and a mixture of *n*-hexane and ether for twofold extraction. The rate of milk fat extraction amounts to about 92%, corresponding to DDT, DDE, and DDD extraction rates of 91.5%, 88.7%, and 96.4%. The extracts are further purified with a combination of dimethylformamide and acetonitrile. The acetonitrile and dimethylformamide extracts are then treated with *n*-hexane for extraction of the pesticide residues. The DDT, DDE, and DDD losses during pesticide extraction with *n*-hexane from the dimethylformamide and acetonitrile extracts are 0.3%, 9.3%, and 4.8%.

74-0486. Novikova, K. F.; Mel'tser, F. R. (Author address not given). **Khromatofotometricheskiy metod opredeleniya ostatochnykh kolichestv ftalofosa v pishchevykh produktakh rastitel'nogo proiskhozhdeniya. [Chromatophotometric method for determining residual amounts of phthalophos in food products of plant origin.]** *Probl. Anal. Khim. 2: 95-99; 1972.* (8 references) (Russian)

Phthalophos is extracted from the food samples with acetone, then transferred into chlorform. Phthalophos is identified on a silica gel layer, from which it is eluted with acetone for photometric determination of the reaction product formed with formaldehyde during acid hydrolysis of phthalophos with chromotropic acid. Benzene was used as solvent for the chromatographic determination, while visualization was achieved with bromophenol blue in acetone, silver nitrate in acetone-water, and acetic acid solution. The sensitivity for visual examination of the chromatogram was 0.3 mg/kg; the sensitivity of the photometric determination was 0.6 mg/kg.

74-0487. Pavlova, N. N.; Chkanikov, D. I.; Makeyev, A. M. (Author address not given). **Metod opredeleniya galoidfenoksiuksusnykh kislot v rasteniyakh. [Determination of halophenoxyacetic acids in plants.]** *Probl. Anal. Khim. 2: 99-104; 1972.* (9 references) (Russian)

An improved version of the Marquardt-Luce method for the determination of halophenoxyacetic acid derivatives such as 2,4-D, 2,4,5-T, 4-chlorophenoxyacetic acid, and 2,4,5-TP is described. The dried and crushed plant material is combined with a tenfold excess of pyridine hydrochloride, and 2,4-D is dealkylated at 207-210°C for one hour. The phenols are then extracted with petroleum ether, from which they are further extracted with ammonium hydroxide. Then, an alcoholic potassium phosphate buffer is added to adjust the pH to 7.0. Solutions of 4-aminoantipyrine and potassium ferricyanide are added, and the optical density of the colored compound is measured at 510-515 nm.

74-0488. Pivovarov, G. A. (Author address not given). **Trebovaniya, pred"yavlyayemyye k gazokhromatograficheskoy apparature pri analize ostatochnykh kolichestv pestitsidov. [Requirements for a gas-**

chromatographic apparatus for the analysis of residual amounts of pesticides.] *Probl. Anal. Khim. 2: 104-110; 1972.* (7 references) (Russian)

Gas chromatographs with electron capture detectors (maximum working temperature 250°C), or with thermionic detectors are suitable for pesticide residue analysis. Electron capture detectors have high sensitivity to organochlorine pesticides (0.1 pg for lindane, 0.4 pg for aldrin, 0.9 pg for heptachlor, 1 pg for dieldrin and *p,p'*-DDE, 4 pg for DDT (TDE), 7 pg for *o,p'*-DDT, and 13 pg for *p,p'*-DDT). Thermionic detectors are especially suitable for the determination of organophosphorus pesticide residues, but may also be used for organochlorine pesticides, though at reduced sensitivity. Special gas-chromatographic apparatus, suitable for the routine determination of pesticide residues in air, water, fodder, soil, food products, and biological materials, should be developed.

74-0489. Pis'mennaya, M. V.; Klisenko, M. A. (Author address not given). **Tonkosloynaya khromatografiya ostatochnykh kolichestv novykh fosfororganicheskikh pestitsidov. [Thin layer chromatography of residual amounts of new organophosphorus pesticides.]** *Probl. Anal. Khim. 2: 111-115; 1972.* (3 references) (Russian)

A thin-layer chromatographic method is described for qualitative and quantitative determination of organophosphorus pesticides such as trichlorfon, dimethoate, vamidothion, ronnel, phencapton, phorate, phosalone, malathion, DEF, and phosmet in air, water, and plant materials. Residues are extracted from air, water, and plant samples with solvents such as ethyl ether, *n*-hexane, and chloroform. Waxes are removed by adsorption chromatography on columns packed with alumina, magnesia, silica gel, or bentonite. Bromophenol was the best visualization reagent on silica gel layer. According to *Rf* values obtained, these organophosphorus compounds can be divided into two groups, one group including compounds with OH, NH2, or NH functional groups (trichlorfon, dimethoate, vamidothion, and menazon) and another group including compounds such as ronnel, phencapton, phorate, phosalone, malathion, DEF, and phosmet. The sensitivity of the thin-layer chromatographic method amounts to 0.1-0.2 mg/kg.

74-0490. Poluboyarinova, I. V. (Author address not given). **Razdeleniye i kolichestvennoye opredeleniye gerbitsidov gruppy 2,4-D kisloty i 2,4-D butilovogo efira v vode. [Separation and determination of herbicides of the group of 2,4-D acid and 2,4-D butyl ester in water.]** *Probl. Anal. Khim. 2: 115-117; 1972.* (Russian)

Following filtration and removal of organic matter, the water sample is extracted with chloroform. The chloroform extract is treated with sodium bicarbonate solution which is again extracted with chlorform. The residue from the chloroform extract is spotted on a silica gel layer, using a 10:2:3 ratio of cyclohexane-benzene-glacial acetic acid as the solvent system, and a silver nitrate solution or an aqueous solution of potassium permanganate in sulfuric acid for visualization in UV light. The 2,4-D acid and 2,4-D butyl ester present could be separated on silica gel, with respective retention times of 0.35-0.4 and 0.7-0.78.

74-0491. Patrashku, F. I.; Sorokskaya, L. B. (Author address not given). **Polyarograficheskiy metod opredeleniya metilnitrofosa v rastitel'noy probe i v pochve. [Polarographic determination of methylnitrophos in plant samples and in soil.]** *Probl. Anal. Khim. 2: 120-123; 1972.* (5 references) (Russian)

A polarographic method can be used for the determination of methylnitrophos (fenitrothion) in plant samples following thin-layer chromatographic purification. The polarograph had a dropping mercury electrode, and acetate buffer at pH 4 was used as reference in the polarographic determination. The two isomers of methylnitrophos gave two similar waves. The simultaneous presence of both isomers is indicated by a summation wave. The sensitivity of the polarographic method amounts to 15 μg per sample.

74-0492. Patrashku, F. I. (Author address not given). **Bumazhno-khromatograficheskiy kachestvennyy i kolorimetricheskiy kolichestvennyy metody opredeleniya metilnitrofosa v rastitel'noy probe i v pochve. [Qualitative paper-chromatographic and quantitative colorimetric determination of methylnitrophos in plant samples and in soil.]** *Probl. Anal. Khim. 2: 123-127; 1972.* (8 references) (Russian)

Following extraction with petroleum ether, the plant and soil samples are cleaned up by vacuum sublimation and passage over a celite column. Paper chromatography is performed with acetone-methanol-water at the mobile phase and paraffin oil in diethyl ether as the stationary phase. The spots are visualized with bromine and a 0.2% solution of methyl orange in 50% aqueous ethanol. The quantitative colorimetric determination comprises ashing, then determination of the total phosphorus content. The sample is treated with sulfuric and nitric acids and heated, then the acidic solution neutralized with ammonia until a yellow color appears. The yellow color of β-dinitrophenol is then removed with sulfuric acid. The sample is then treated with ammonium molybdate. The phosphomolybdate complex is reduced with tin chloride and the blue solution read in a colorimeter with a red filter.

74-0493. Samosvat, L. S. (Author address not given). **Opredeleniye gerbitsidov gruppy fenilmocheviny i anilidov karbonovykh kislot vo vneshney srede: vode, pochve, biomaterialakh rastitel'nogo i zhivotnogo proiskhozdeniya. [Determination of herbicides of the phenylurea and carboxylic acid anilide groups in the environ-**

ment: water, soil, and biological materials of plant and animal origin.] *Probl. Anal. Khim. 2: 127-130; 1972.* (4 references) (Russian)

The analysis for herbicides is based on the formation of colored spots on an alumina layer by thermal decomposition of the preparations at 160-170°C, diazotization of the formed aromatic amines with sodium nitrite, and reaction of the phenyldiazonium salt with α-naphthol. Water, soil, potato, and blood samples are extracted with chloroform or ether, and the samples are transferred to the plate without preliminary cleanup. Other plant materials (corn, aquatic plants, green pea, and grains) first have to be treated with concentrated sulfuric acid to break down the cells. Hexane or methanol is used for extraction of biological materials containing little fat. Hexane extracts of fat-rich samples are made basic prior to renewed extraction with *n*-hexane. Ether, trichloromethane, and mixtures of these are used as solvents for the thin-layer chromatographic determination. Visualization is accomplished with sodium nitrite solution in hydrochloric acid, and with α-naphthol in potassium hydroxide solution. The sensitivity of the method is 10-20 μg per sample. Accumulation of phenylurea-derived pesticides, but not of propanil, in plant materials was observed.

74-0494. Sedykh, A. S.; Popov, P. V.; Abelentseva, G. M.; Shapovalova, G. K.; Ivanova, G. B. (Author address not given). **Chuvstvitel'nost' biologicheskogo i tonkosloynokhromatograficheskogo metodov opredeleniya ostatkov pestitsidov. [Sensitivity of biological and thin-layer chromatographic methods of determining pesticide residues.]** *Probl. Anal. Khim. 2: 130-135; 1972.* (7 references) (Russian)

The biological method, using *Calandra orysae*, *Drosophila melanogaster*, and *Culex pipiens molestus*, was compared with thin-layer chromatographic methods for the determination of a variety of pesticide residues. The mosquito imago was most sensitive to the pesticides studied, permitting detection of quantities in the order of magnitude of 0.00003 to 5 mg/l. The thin-layer chromatographic method, using a silica gel layer and bromophenol blue with silver nitrate and possibly acetic acid for visualization, was more than 100 times less sensitive than the gnat imago test for the detection of methyl ethyl parathion, fenitrothion, methyl parathion, malathion, phorate, trichlorfon, and dichlorvos, and 63, 19, 17, and 18 times less sensitive for phosmet, methylmercaptophos, phosalone, and carbaryl. The two methods were practically equivalent in the detection of vamidothion, dimethoate, and formothion. While the gnat imago test lacks specificity, it is more suitable for determination of the overall toxicity of the original active agent and its metabolites than the thin-layer chromatographic method. The biological method can be applied to the determination of pesticide residues in extracts from water, soil, plants, and animal tissues.

74-0495. Soboleva, D. A.; Makarova, S. V. (Author address not given). **Opredeleniye nekotorykh fosfororganicheskikh pestitsidov titrovaniyem v nevodnykh sredakh. [Determination of some organophosphorus pesticides in nonaqueous media.]** *Probl. Anal. Khim. 2: 136-138: 1972.* (5 references) (Russian)

A method is described for the extraction and potentiometric titration of organophosphorus pesticides, such as trichlorometaphos-3 (ronnel), trichlorfon, parathion, and methylnitrophos (fenitrothion) in nonaqueous media. The sample to be analyzed is mixed with alkaline methanol solution for extraction. The extract is neutralized with hydrochloric acid until a potential of about 300 mV is reached, after which two-step extraction with benzene is performed. The extract is combined with ethanol and titrated potentiometrically until the second potential jump occurs. The accuracy of the determination is ± 0.5%. Extraction yields are best with chloroform for *p*-nitrophenol and *p*-nitrocresol, and with benzene for trichlorophenol. Quantitative extraction and satisfactory titration of these phenols in the presence of small amounts of strong acids were determined. Interference due to alkylthiophosphoric acid formed by hydrolysis of chloralkylthiophosphates was not noted.

74-0496. Simonov, V. D.; Mamina, F. A.; Gerasimova, A. I.; Alyamkin, Yu. N.; Akhunov, T. F.; Vyazovkina, G. I. (Author address not given). **Metod opredeleniya osnovogo veshchestva v gerbitsidnykh preparatakh yalana. [Determination of basic substances in herbicidal preparations of yalan.]** *Probl. Anal. Khim. 2: 138-142; 1972.* (3 references) (Russian)

The suitability of gas chromatographic, spectroscopic, and potentiometric (titrimetric) methods for determination of the active agent in technical thiolcarbamate and its preparations (oil emulsions and granular molinate) was studied. Quantitative separation of the individual components was achieved by gas chromatography using apiezon M with 20% or 1.5% stearic acid as stationary phase, 80-100 mesh silanized brick as solid carrier, a column temperature of 190°C, and a hydrogen flow rate of 240 ml/min. Dimethylphthalate was used as internal standard. A spectrophotometer with a sodium chloride crystal, a scanning rate of 58 cm/min, and a potassium bromide cuvette were used for the IR spectroscopic, quantitative determination of the active agent in technical preparations and oil emulsions. The titrimetric method is based on the hydrolysis of *S*-ethyl-*N*-hexamethylenethiolcarbamate, after which the amine formed is determined by acid-base titration with sulfuric acid. The hydrolysis is done with 85% orthophosphoric acid at 130°C for 45 min.

74-0497. Stonov, L. D.; Fofanov, V. N. (Author address not given). **Opredeleniye monurona i diurona v vode i pochve. [Determination of monuron and diuron in water and soil.]** *Probl. Anal. Khim. 2: 142-145; 1972.* (7 references) (Russian)

A qualitative thin-layer chromatographic method and a quantitative UV spectrophotometric method for the determination of diuron and monuron in water and soil are described. Monuron and diuron are extracted from water with chloroform. The chloroform extract is evaporated, and the dry residue is dissolved in ethanol for identification on a silica gel layer using 1:1, 1:5, and 4:7 ratios of nitromethane with chloroform as solvent system. The detection limit is 0.3-1 μg. For quantitative determination the ethanol extract is evaporated, and the dry residue is dissolved in distilled water for spectrophotometric determination under UV light at 255, 245, and 230 nm (monuron) and at 260, 249, and 230 nm (diuron). Identical quantitative and qualitative analytical procedures are applied to monuron and linuron samples in soil, from which they are extracted with acetone-water or ethanol-water mixtures, possibly after the addition of potassium sulfate or calcium chloride to the soil.

74-0498. Supin, G. S.; Sister, Yu. D.; Kozlova, I. V. (Author address not given). **Polarograficheskiye metody analiza pestitsidov. [Polarographic methods for analysis of pesticides.]** *Probl. Anal. Khim. 2: 145-155; 1972.* (136 references) (Russian)

Polarographic methods have been elaborated for the analysis of such pesticides as DDT, lindane, dithiocarbamates, thiram, parathion, fentrothion, paraoxon, aldrin, atrazine, simazine, warfarin, DNOC, dieldrin, karathane, maneb, methoxychlor, pentachloronitrobenzene, trichlorfon, chlorothion, zineb, ziram, endrin, and other organic preparations. Oscillopolarographic methods are 5 to 10 times more sensitive than conventional polarography, permitting a minimum detectable concentration of 1 *μM*. An amperometric method, a combination of titration with polarography, was successfully adopted for determination of trace quantities of organochlorine pesticides such as polychloropinene, hexachlorobutadiene, and heptachlor, which were titrated amperometrically with mercurous chloride after chromatographic separation. Polarographic methods are also suitable for the study of pesticide metabolism.

74-0499. Tsitovich, I. K.; Kuz'menko, E. A. (Author address not given). **Ioniobmennoye kontsentrirovaniye i opredeleniye mikrokolichestv TKhA i 2,4-D v pochve rastitel'nom materiale. [Ion exchange concentration and determination of TCA and 2,4-D in soil and plant material.]** *Probl. Anal. Khim. 2: 155-157; 1972.* (8 references) (Russian)

Methods for the concentration and determination of trace quantities of TCA and 2,4-D in soil, water, and plant materials are presented. Residues of TCA and 2,4-D are concentrated 400 to 500 times using an AV-17 type anion exchanger in the chloride form, followed by elution with the minimum quantity of a liquid such as 4*N* sodium chloride solution. Following concentration, TCA is determined by means of the pyridine method, providing for an error of 0.9-1.3%, and 2,4-D is determined by means of butylrhodamine with an error of 0.3-1.2%. The sensitivity of the 2,4-D determination in soil amounts to 2-2.5 mg/kg.

74-0500. Polyakova, V. N. (All-Union Inst. Exp. Vet., USSR). **Opredeleniye DDT i gamma-izomera GKhTsG v zernofurazhe. [Determination of DDT and hexachlorocyclohexane gamma-isomer in grain forage.]** *Veterinariya 7: 74-76; 1970.* (Russian)

A thin-layer chromatographic method for the qualitative and quantitative determination of DDT and gamma-BHC (lindane) in grain forage is described. The pesticides are extracted from grain forage samples with *n*-hexane and purified and dried with anhydrous sodium sulfate. The purified sample is applied on silica gel or alumina layer in *n*-hexane and the layer then sprayed with a visualizing agent and irradiated with UV light for development. In the presence of DDD (TDE) or TCM-3 along with DDT and lindane, *n*-hexane-acetone in a ratio of 5:1 is used as solvent system. The sensitivity of the method lies at 0.1 mg/kg with an accuracy of 85%.

74-0501. Girenko, D. B.; Klisenko, M. A. (Lab. Pestic. Anal. Chem., All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polymers Plastic Materials, Kiev, USSR). **Primeneniye metoda gazovoy khromatografii dlya analiza ostatochnykh kolichestv fenilzameshchennykh proizvodnykh mocheviny. [Use of a gas chromatographic method for the analysis of residues of phenyl-substituted derivatives of urea.]** *Vop. Pitan. 31: 89-91; 1972.* (8 references) (Russian)

A gas chromatographic method for the determination of trace quantities of compounds such as diuron, linuron, monuron, and chloroxuron in potatoes, water, and air is described. A glass column of 1 m length and 3 mm diameter with Chromosorb W (5% SE-30 or 5% SE-30+0.1% epikote) was used for the analyses. Diuron was extracted at a rate of 71.2-75% with chloroform to determine diuron in potatoes. Phenyl-substituted urea residues in water are extracted with chloroform, dried with anhydrous sodium sulfate, and transferred on the column in acetone. The recovery rate for linuron and diuron in water was 77%. Filter type AFA-KhA-18, degreased cotton-wool, and KSK type silica gel were used for the adsorption of phenylurea compounds from air. The residue was extracted from the sorbents by means of chloroform at a rate of 10-15%.

74-0502. Kuchinskiy, A. L.; Sokhor, L. Ye. (Mogilev Regional Sanit. Epidemiol. Station, Mogilev, USSR). **K metodike kolorimetricheskogo opredeleniya ostatochnykh kolichestv polikhlorpinena v kartofele. [Method of colorimetric determination of polychloropinene residues in potatoes.]** *Vop. Pitan. 31: 91-93; 1972.* (3 references) (Russian)

The crushed sample is first treated with anhydrous sodium sulfate, after which extraction is done with petroleum ether. The dry extract is combined with pyridine and 0.1 *N*-solution of sodium hydroxide during heating in water bath. The sample is cooled down, and glacial acetic acid and aniline are added for colorimetric determination. In the presence of polychloropinene residue the solution assumes a stable orange color due to the formation of glutaconic aldehyde dianilide. The sensitivity of the method is 5 μg per sample or 0.1 mg/kg. Hexachlorane (BHC), DDT, and trichlorfon do not interfere with the determination of polychloropinene. Polychloropinene residues were detected in potatoes previously treated with this pesticide.

74-0503. Bogomolova, Z. N.; Tarasova, A. M. (Lab. Pestic. Toxicol. Inst. Nutrition USSR Acad. Med. Sci., Moscow, USSR). **Razdel'noye opredeleniye izomerov GKhTsG i fenotiazina pri ikh sovmestnom soderzhanii v produktakh zhivotnogo proiskhozhdeniya. [Differential determination of isomers of BHC and phenothiazine simultaneously present in foods of animal origin.]** *Vop. Pitan. 4: 72-74; 1973.* (9 references) (Russian)

A thin-layer chromatographic method for the differential quantitative and qualitative determination of α- and γ-BHC and phenothiazine in veal, chicken, milk, and eggs is described. Homogenized meat and egg samples are combined with anhydrous sodium sulfate, and the pesticide residues extracted with 2:1 ratio of hexane and acetone for subsequent centrifugal phase separation. The extracts are filtered and purified with hexane-dimethylformamide. The hexane extracts are then transferred to an alumina column for the elution of the BHC isomers and phenothiazine with hexane. Aliquot portions of the samples, together with standard solutions, are applied to Silufol layer which is then treated with hexane-diethylether-acetic acid system (75:25:2). The layer is sprayed with 1% solution of diphenylamine in acetone and irradiated with UV light for the visualization of α-BHC (gray spots), γ-BHC (dark blue or dark gray spots), and phenothiazine (pink spots). Quantitative determination is possible by comparison of the respective spot areas and from the spot color intensities. The sensitivity of the chromatographic method is 0.2 μg for BHC isomers and 0.1 μg for phenothiazine. Quantitative determination is possible for a minimum concentration of 0.10 mg/kg.

74-0504. Vasyagina, R. D.; Chmil', V. D. (Lab. Anal. Chem. Pestic., All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polymers, Plastic Materials, Kiev, USSR). **Opredeleniye ostatochnykh kolichestv butilovogo efira 2,4-D v kartofele metodom gazo-zhidkostnoy khromatografii. [GLC determination of 2,4-DB residues in potatoes.]** *Vop. Pitan. 4: 78-80; 1973.* (4 references) (Russian)

A method is described for the gas-liquid chromatographic determination of 2,4-DB residues in potatoes using an internal standard and differential flame ionization detector. The 2,4-DB residue is extracted from crushed potato by *n*-hexane. The hexane extract is dried with anhydrous sodium sulfate, after which the solvent is evaporated. A measuring column with chromosorb filling, nitrogen at a flow rate of 60 ml/min as carrier gas, an evaporator temperature of 230 C, and a column temperature of 186 C were used for the determination. The relative retention time for 2,4-DB was 1.45, compared to the internal standard (2,4,5-T). The rate of recovery of 2,4-DB in potatoes ranged from 95.3 to 105.3%. The relative error of the GLC method is ±5.35% and the sensitivity 10 μg per sample.

74-0505. Reeves, J. M.; Bradley, E. B.; Frenzel, C. A. (Dept. Electrical Eng., College of Eng., Univ. Kentucky, Lexington, KY 40506). **Detection of salts of 2,4-D in aqueous solution by laser Raman spectroscopy.** *Water Res. 7(10): 1417-1429; 1973.* (9 references)

Concentrations of sodium and potassium salts of 2,4-D of 500 ppm or more in water solution can be detected through the use of laser Raman spectroscopy. The Raman spectra differed for 2,4-D and its salts, but were nearly identical for the different salts. Spectra of the same salt in powder form and in aqueous solutions were substantially different. Five strong bands were observed in aqueous solution, four of them detectable at 500 ppm. With a more powerful laser than the 50 mW He-Ne gas laser used, lower concentrations could be determined.

74-0506. Tanabe, H. (Nat. Inst. Hyg. Sci., Tokyo, Japan). **[Methods of analysis of PCB (polychlorinated biphenyls) in edible oil and fat.]** *Yukagaku (J. Jap. Oil Chem. Soc.) 22(1): 35-40; 1973.* (7 references) (Japanese)

Measurement of chlorine ion or biphenyl in PCB after complete dechlorination of PCB in alcohol is not sufficiently sensitive for measuring PCB residues in foods. Newly developed methods, such as total chlorination, permit accurate determination of PCB and separation from organochlorine pesticides. After extraction from fat and initial cleanup by partitioning, the PCB is separated from organochlorine pesticides, other than DDE, by passage over a silica gel column. If 2 g of activated silica gel is used, a separatory funnel containing 100 ml of *n*-hexane is attached to the top of the glass column. The first 10-20 ml of hexane passed through is discarded; the following portion (not more than 50 ml) is collected, and should contain all the PCB and DDE. The quantity required depends on the amount of PCB present and the activity of the silica gel, so preliminary analyses must be run. The organochlorine pesticides remaining on the column are then eluted with 15% ethyl ether in *n*-hexane and determined by GLC. If the DDE peak is more than 5 times as great as the maximum PCB peak, separation of PCB and DDE by slow elution from

a silica gel column with large quantities of hexane is necessary for quantitation.

74-0507. Vasil'ev, A. F.; Pankova, M. B. (All-Union Sci. Res. Inst. Chem. Means Plant Protection, USSR). **O vozmozhnostyakh lineynogo i vypuklogo programmirovaniya dlya kolichestvennogo analiza po spektram poglashcheniya (II). [On the possibilities for application of linear and quadratic programming to quantitative analysis by means of absorption spectra. Part 2.]** *Zavod. Lab. 38(9): 1079-1083; 1972.* (Russian)

The application of linear and quadratic programming to the quantitative analysis of residues by means of their absorption spectra is described for four-component mixtures of the α-, γ-, δ-, and ϵ-isomers of BHC in acetone, and for two- and three-component mixtures of linuron and desmethyl linuron in acetonitrile. The relative error involved in application of the method of least squares to the analysis of the four-component BHC mixture reached 62% due to the presence of the absorption spectra of ϵ-BHC, while the corresponding error of the linear programming method does not exceed 3%. Comparison of the calculation results with actual measurement data reveals the applicability of the linear and quadratic programming methods to the quantitative analysis of pesticide residues from their absorption spectra. Accuracy is increased, especially in the analysis of multi-component mixtures of varying composition. When used on computers with stored spectral data, these methods are also suitable for the qualitative determination of complex mixtures.

74-0508. Noll, M.; Bauer, U. (Institut fuer Wasserforschung GmbH, Dortmund, Germany). **Empfindliche Schnellmethode zum Gruppennachweis von Herbiziden durch Hemmung der Trichom-Wanderung von Blaualgen. [Rapid sensitive herbicide bioassay by inhibition of trichome migration of bluegreen algae.]** *Zentralbl. Bakteriol. Infektionskr. Hyg. Abt. I. Orig. B 157: 178-183; 1973.* (9 references) (German)

The inhibition of *Phormidium* trichome migration was used for detection of herbicide groups. The algae were placed on DC-alufoil Cellulose (No. 1) or paper filter, and the pH value was set between 5 and 11. The preparations and the herbicides to be tested, the latter dissolved in acetone or trichloromethane, were placed in Petri scales with little moisture, and illuminated with a fluorescent lamp for the measurement of the rate of trichome migration inhibition caused by the herbicides. The limits of detectability for 2,4-D, MCPA, MCPB, 2,4,5-T, 2,4,-DB (phenoxycarboxylic acid derivatives); diuron, linuron, fluometuron, chloroxuron, metobromuron, cycluron (urea derivatives); simazine, atrazine, ametryne, prometryne (triazine derivatives); IPC, CIPC, triallate (carbamates); W 13 465 (naphthoquinone), and paraquat (dipyridylium compound) were 0.3-15; 1.5-15; 0.3-15; 6-15; 15; and 6-15 μg/spot, respectively. The test can be carried out within three hours by simple techniques.

74-0509. Klisenko, M. A.; Vekshteyn, M. Sh. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic. Polymers Plastic Materials, Kiev, USSR). **Spektrofotometricheskoye opredeleniye ditiokarbaminatov i produktov ikh prevrashcheniya v sochetanii c tonkosloynoy khromatografii. [Spectrophotometric determination of dithiocarbamates and products of their conversion combined with thin-layer chromatography.]** *Zh. Anal. Khim. 28(1): 159-162; 1973.* (3 references) (Russian)

A combined thin-layer chromatographic and UV spectrophotometric method for the identification and quantitative determination of zinc dimethyldithiocarbamate (ziram) and its metabolites (tetramethylthiuramdisulfide, tetramethylthiourea, dimethylamine dimethyldithiocarbamate) and of zinc ethylene-bis-dithiocarbamate (zineb) and metabolites (ethylenethiurammonosulfide and ethylenethiourea) is described. Thin layer of alumina with starch, *n*-hexane:benzene:acetone in a ratio of 10:1:2.5 for dimethyldithiocarbamates, benzene:*N,N*-dimethylformamide in a ratio of 9:1 for ethylene-bis-dithiocarbamates as solvent systems, and iodine azide as visualizing agent were used for chromatographic separation. Chloroform in 0.2 *N* aqueous solution of sodium hydroxide was used for the solution of the chromatogram spots for subsequent UV spectrophotometric determination in a wave-length range of 220-400 nm. High-intensity absorption bands in the ranges of 230-260 nm and 275-290 nm were characteristic of the compounds studied. The method is suitable for the determination of 2 to 30 μg of each compound. The accuracy is ± 0.89-2.9%.

74-0510. Kosmatyy, Ye. S.; Kavetskiy, V. N. (Ukrainian Sci. Res. Inst. Plant Prot., Kiev, USSR). **Polyarograficheskoye opredeleniye sery v nekotorykh serusoderzhashchikh pestitsidakh. [Polarographic determination of sulfur in some sulfur-containing pesticides.]** *Zh. Anal. Khim 28(5): 1028-1029; 1973.* (6 references) (Russian)

A polarographic method for the quantitative determination of pesticides such as rogor (dimethoate), thiourea, phencapton and diazinon, and thereby for the determination of these pesticides in biological materials, is described. The use of metallic aluminum as reducing agent in 20% hydrochloric acid solution in the presence of nickel permits quantitative separation of sulfur from sulfur-containing pesticides in the form of hydrogen sulfide which later is absorbed by 1*M* sodium hydroxide solution containing 0.00002 mol of lead acetate per liter. The amount of hydrogen sulfide evolved is determined by the increase of the lead ion concentration in the absorbent solution. The sensitivity of the polarographic method is 0.5 μg of sulfur in 2 ml solution. The polarographic method is applicable to the determination

of sulfur-containing organic compounds in biological materials following identification by thin-layer chromatography.

74-0511. Filimonova, M. M.; Gorbunova, V. Ye. (Author address not given). **Polyarograficheskoye opredeleniye khlorampa v vodakh, pochvakh i rasteniyakh. [Polarographic determination of chloramp (potassium 4-amino-3,5,6-trichloropicolinate) in water, soil, and plants.]** *Zh. Anal. Khim. 28(6): 1184-1187; 1973.* (14 references) (Russian)

Polarography is used to determine chloramp (potassium salt of picloram), isolated from water, soil and plant material. Filtrates from water samples are adjusted to a pH value of 1 by means of 10 *N*-sulfuric acid. The solution is then transferred into an electrolyzer for the determination of an integral polarogram. The wave height is measured, and the chloramp concentration is determined from a calibration curve. The sensitivity is 0.2 mg/l. at an error of 6%. The chloramp content is extracted from light, sandy soils by means of acetone, after which hydrochloric acid is added. The eluate obtained on alumina column is adjusted to pH 1, and a differential polarogram taken. The extraction from heavy soils with high humus content is accomplished with an aqueous solution of potassium hydroxide. The same extraction technique is applied for dry plant masses, after which the ether extract is purified on alumina. The sensitivity of the polarographic method for soil and plant samples is 0.07 and 0.25 mg/kg, respectively. Both chloramp and picloram acid give a quasi-diffusion two-electron wave of the reduction of the amino group cation to ammonia and 3,5,6-trichloropicolonic acid in strongly acidic media. The acid gives a four-electron wave of reduction of two chlorine atoms if 0.05 *N* tetraethylammonium hydroxide is used as supporting electrolyte.

74-0512. Chalaya, Z. I.; Voznaya, O. M. (Author address not given). **Primeneniye ionitov v analize tsis-beta-khlorakrilata natriya. [Use of ion exchangers in the analysis of sodium *cis*-beta-chloroacrylate.]** *Zh. Prikl. Khim. (Leningrad) 46(4): 882-884; 1973.* (7 references) (Russian)

The suitability of the anion exchangers AV-17, EDE-10P, and AN-2F for the separation of sodium *cis*-beta-chloroacrylate from its aqueous solutions and from chloroacetone in chlorine form was studied. The medium-basic anion exchanger EDE-10P was found best for the concentration of trace quantities of sodium *cis*-beta-chloroacrylate and for its separation from chloroacetone. Sodium *cis*-beta-chloroacrylate is eluted best by means of 1 *N*-hydrochloric acid.

74-0513. Frimmel, F. (Inst. f. Wasserchem. und Chem. Balneol., Technische Univ. Muenchen, Munich, Germany). **Unterscheidung von polychlorierten Biphenylen und Pestiziden mit gekoppelter Gaschromatographie/Massenspektrometrie. [Distinction between polychlorinated biphenyls and pesticides with combined gas chromatography/mass spectrometry.]** *Z. Wasser-Abwasserforsch. 6(4): 113-116; 1973.* (12 references) (German)

A combined gas chromatographic/mass spectrometric method for the differentiation of PCBs and organochlorine pesticides in their mixtures is described. The use of the peak group specific technique leads to an unequivocal distinction between the two groups of substances. Mixtures of 50% chlorinated biphenyls (Clophen A 50) and DDE, DDT, endosulfan, and endrin in ratios of 2:1 and 1:1 were used as an example of how to choose peak groups for a clear identification of high sensitivity. The peak groups suitable for the identification of DDE and endosulfan, i.e., those containing few or no signals of PCBs, were between 244 and 248 m/e and between 316 and 322 m/e for DDE and between 205 and 209 m/e for endosulfan. A gas chromatograph with chromosorb 6 column, a column temperature of 209 C, an injection temperature of 235 C, a helium flow rate of 50 ml/min, two-step helium separator and electron capture detector, as well as CH7 model mass spectrometer with an oscillographic UV display unit were used for the analyses.

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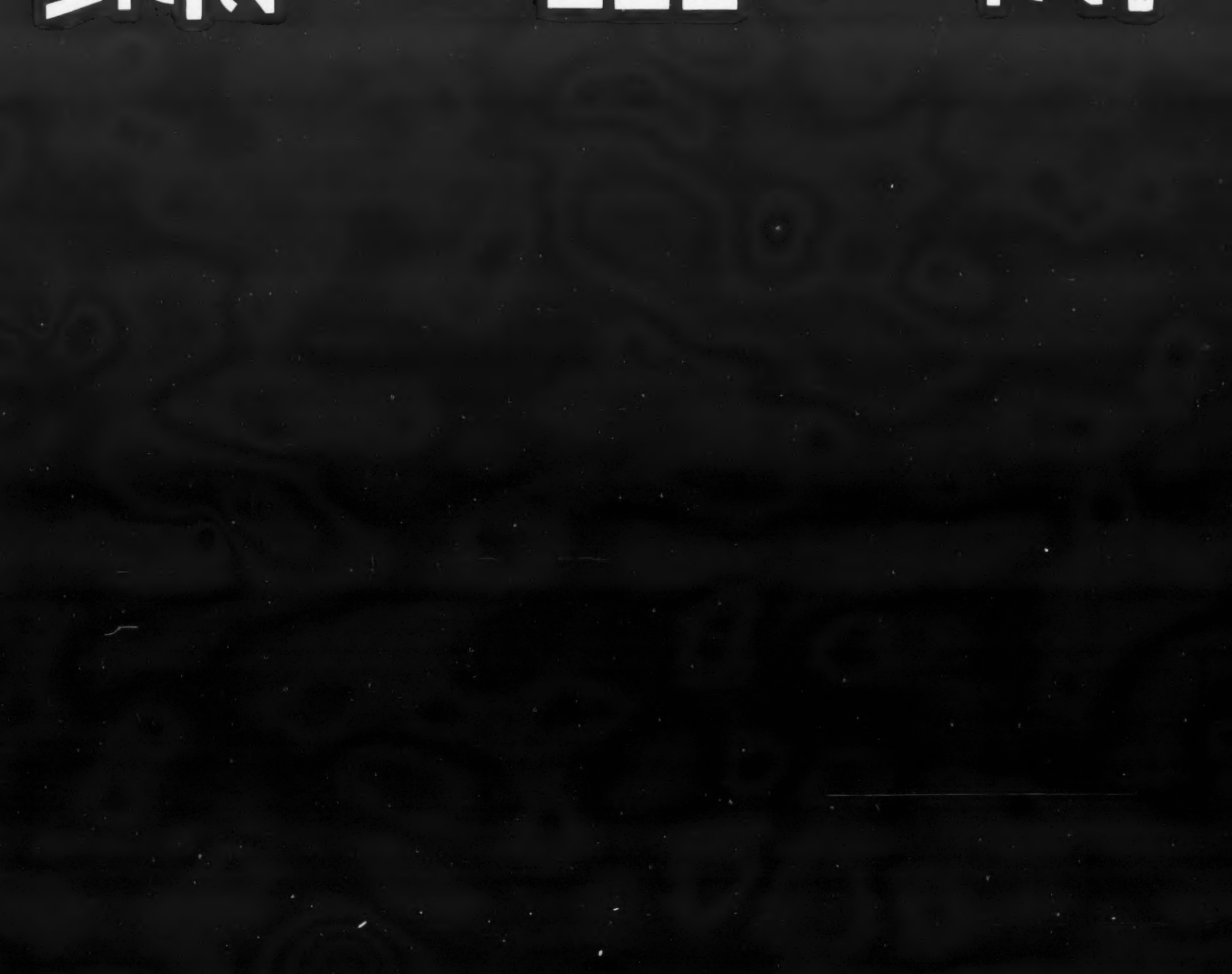
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